THE GENUS *XYRIS* (XYRIDACEAE) IN VENEZUELA AND CONTIGUOUS NORTHERN SOUTH AMERICA[1]

Robert Kral[2]

ABSTRACT

This work is a taxonomic treatment of those species of Xyris *(Xyridaceae) now known to occur in Venezuela and contiguous northern South America, including parts of Brazilian Amazonia. A general discussion of the morphology of* Xyris *is given, particularly as to the construction of the inflorescence and flower. Problems with the previously accepted sections of* Xyris *are stated; it appears that the major distinguishing feature for these sections (placentation type) breaks down when Guayanan material is studied. The taxonomy is done for 87 species (14 newly described), including 4 subspecies (one newly described) and 7 varieties. Synonymy and full descriptions are presented, along with diagnostic keys. Nearly all taxa are illustrated with full plates.*

The first comprehensive treatment of *Xyris* of the Guayana Highland was authored by Dr. Bassett Maguire of the New York Botanical Garden and Dr. Lyman B. Smith of the Smithsonian Institution (Botany of the Guyana Highland V, *Memoirs of the New York Botanical Garden* 10: 8–72. 1963). That excellent work has provided a basis for this supplemental study, which includes new information on species already described and descriptions of several new *Xyris*. Also, the coverage is extended to include Andean species from western Venezuela and Colombia as well as those from the Guayanas to the east and the contiguous territories of Brazil. Useful sourceworks for this have been: J. M. Idrobo, "Xyridaceas de Colombia," *Caldasia* VI(29): 185–245. 1954; J. Lanjouw, Xyridaceae *in Flora of Suriname* I(1): 225–244. 1966; L. B. Smith & R. J. Downs, Xyridaceae *in Flora Brasilica* IX(11): 1–211 + index. 1968; L. B. Smith & R. J. Downs, "Las especies Peruanas de la Familia Xyridaceae," *Publicaciones del Museo de Historia Natural "Javier Prado," Serie B. Botanica* (15)1–13, + figs. 1963.

As was stated by Maguire & Smith (l.c.), Brazilia, to the south of the Amazon, and Guayana, to the north, comprise the two largest centers for *Xyris* in the world; each major area has large numbers of endemics, with new ones being discovered on any major expedition into these regions. The authors continue:

> It is suggested that *Xyris* in South America, with its present bicentric distribution, may have occupied at one time an essentially identical and continuous area, and that in subsequent history, by the intervention of the Amazon Basin, the original area became divided, and that since then a parallel evolution has proceeded without appreciable interchange.

[1] *Many hundreds of specimens have been examined in the preparation of the work and I acknowledge the assistance of curators and staffs of F, GH, K, L, MO, NY, P, U, and US who kindly made loans and facilities available. I could not have done the work were it not for Dr. Lyman B. Smith, who provided me the opportunity to undertake the project in the first place, who reviewed descriptions of most of the new species, and who is therefore coauthor of them; Dr. Otto Huber, ecologist and authority on the botany of tropical American savanna, who has provided specimens for study, who led me to a grand, albeit short, trip into the Yapacana savannas, and who has provided friendly criticisms along the way; and Dr. Julian A. Steyermark, whose experience with and knowledge of Venezuelan botany is unsurpassed, and who has made specimens and information available. To all of the above I am deeply grateful. Special thanks are due to Dr. George Rogers, Editor, and to Ms. Janice Wilson, Editorial Assistant, for their patient, thorough, and tactful processing of my work. Their constructive editing has much enhanced the study, and is therefore very gratefully acknowledged.*

[2] *Herbarium, Box 1705, Station B, Vanderbilt University, Nashville, Tennessee 37235, U.S.A.*

My observations in no way conflict with the above. I can only add that, since the addition of the monotypic *Aratitiyopea* by Steyermark (*Ann. Missouri Bot. Gard.* 71: 298–300. 1984), there are now five genera known for the Xyridaceae, all occurring in, if not solely confined to, the Venezuelan Guayana, with the greatest diversity being in the high sandstone tepuis of the region. *Xyris* is by far the largest of the five. At the rate new species are now being found it will probably well exceed 300 species worldwide. Prior workers have organized these into three subgenera, namely *Pomatoxyris* Endl. with ca. 20 species, Australian, distinguished by axile placentation; *Xyris* (*Euxyris* Endl.) with ca. 100 species, pantropic and North American, distinguished by marginal or parietal placentation; and *Nematopus* Seub., with probably more than 200 species, mainly South American and distinguished by basal or free-central placentation. In dissecting ovularies of Guayanan xyrids preparatory to describing them, I discovered that many of these species, placed by prior workers in *Nematopus*, actually have axile placentation or are transitional from axile, this evidenced by the presence of complete or partial septa in the ovary and fruit. Out of slightly more than 80 taxa studied, 33 show evidence of some septation; some show completely axile placentation.

I suggest that sectionalization of *Xyris* based on mode of placentation perhaps does not reflect the real situation and that there appear to be no other solid characters by which to place species within sections or subgenera consistently. Certainly the sections are arbitrary. Alternatives would be to put the more than 30 Guayanan species with partial or complete septation into *Pomatoxyris*, a perhaps more realistic alternative, even though it eliminates the geographic integrity of that section. Another would be to dispense with *Pomatoxyris*, since subgenus *Xyris*, even as represented in the southeastern United States, may show transition from axile to parietal placentation (*X. elliottii* Chapman, *X. baldwiniana* Schultes, *X. brevifolia* Michaux); therefore, the limits of section *Xyris* could be amplified to accommodate the situation. A third alternative, namely to eliminate the sections altogether, would in my view be best, in that mode of placentation has been nearly the entire basis.

In any event, it would appear that in regard to a phylogeny the Guayana Highland show the greatest diversity in xyrids, with placentation in all genera except *Xyris* wholly axile. It seems that distichous-leaved xyrids with axile placentation have evolved from polystichous-leaved ancestors with axile placentation, at least if Abolbodaceae are to be considered as part of Xyridaceae, a generally accepted classification based on the sound anatomical analyses of Carlquist and others. That being so, *Xyris* may have had its origin in the Guayana Highland.

No further introduction is needed here save to relate what appears to be the basic morphology in *Xyris*.

Species of *Xyris* are mostly high hydroperiod, rosulate plants of acid boggy sites, their alternate, equitant, distichous, lineal leaves approximate and arising from contracted or elongated stems or from scaly rhizomes; some rise from bulbous axillary offshoots; the roots are simple and fibrous (Fig. I).

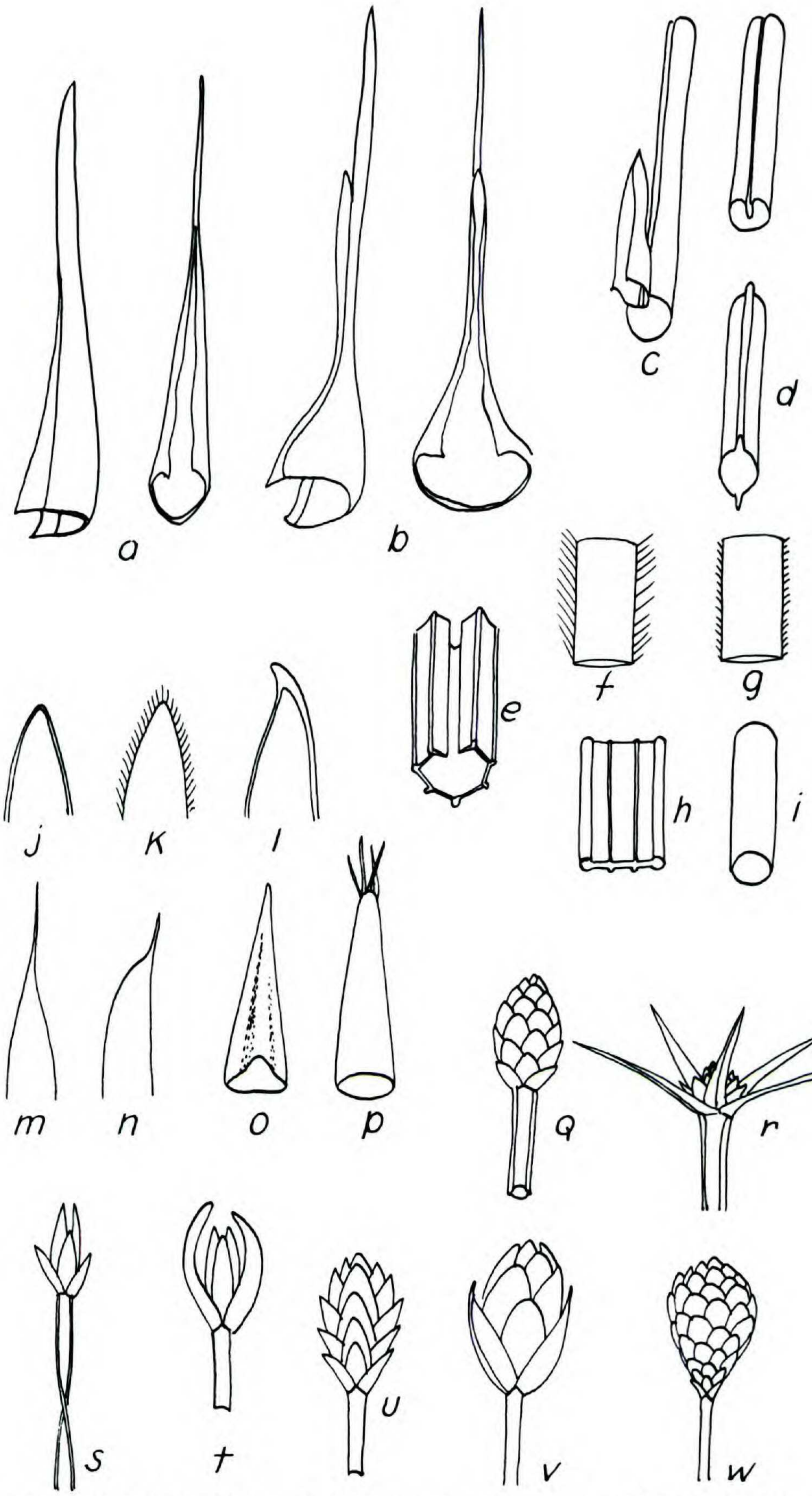
Leaves are highly variable in structure but are similar to those of *Iris*. The leaf base is open-sheathing, the sheath edges broad and thin, often scarious or hyaline, and entire or variously ciliate; the sheath base is frequently abruptly orbicular-dilated, this most obvious in species with bulbous bases. Above the clasping sheath base, the sides narrow abruptly or gradually to the blade, there converging and merging with it as the ventral margins close. At this point there may be a simple transition to the inner margin of the blade (most species), or the transition may be abrupt, with a ligule of various proportion being produced (Fig. IIb, c). Often in ligulate species the inner edge of the leaf blade may show a strong sulcus or groove for some distance above this junction (Fig. IIc). The leaf blade then shows a convergence of leaf sheath edges to form either a set of ventral edges (as in sulcate-bladed

FIGURE I. *Sketches of some common habits in* Xyris.—*a. Base soft, leaves flattened, sheaths keeled.*—*b. Base bulbous, sheaths fleshy-based, blades curvate, flattened.*—*c. Base elongate-bulbous, sheaths firm, blades flexuous and twisted.*—*d. Plant caulescent and rhizomatous, leafy shoots frondlike.*—*e. Plant stout-rhizomatous.*—*f. Annual, leaves spreading flabellately; scape sheaths longer than principal leaves.*

species), or the ventral edges have joined into a single, compound-traced, ventral edge (Fig. IIa). Much *Xyris* taxonomy centers around the characters of the leaf sheath and blade, which tend to be more consistent than most, outside of flower and fruit features. For example, *Xyris* leaf blades may be terete or angulate or flattened; their tips may be extremely varied, with everything from emarginate to conic-subulate, even setiform; their edges and borders are incrassate to thin and variously pubescent or totally smooth; the

→

FIGURE II. *Leaves, spikes, and upper scapes.*—*a. Side and ventral views of leaf with sheath gradually dilated to base, eligulate, blade flattened.*—*b. Side and ventral views of leaf with sheath abruptly dilated at base (a bulbous type), ligulate, blade flattened.*—*c. Sector of leaf at junction of ligule and blade, blade subterete, with*



ventral sulcus.—d. Sector of leaf blade, this subterete and bicostate.—e. Thin, involute, multicostate blade.—f. Sector of flattened, ciliate leaf blade.—g. Sector of flattened, scabrid leaf blade.—h. Sector of flattened leaf blade with incrassate edges.—i. Sector of terete leaf blade.—j. Acute, incrassate-edged leaf apex.—k. Acute, ciliate leaf apex.—l. Acuminate, incrassate-edged, incurved leaf apex.—m. Acuminate, spinulose-tipped leaf apex.—n. Asymmetrically spinulose-tipped, acute leaf apex.—o. Trigonous-acute leaf apex.—p. Leaf apex narrowly and bluntly conic, trichomiferous.—q. Ovoid spike with spirally imbricate bracts (commonest type with little bract gradation); scape subterete, bicostate.—r. Broadly ovoid spike, sterile bracts involucrate, scape ancipital.—s. Spike biflorous, decussate, scape flattened, incrassate-bordered, twisted.—t. Spike biflorous, decussate, lowest bracts exceeding spike, incurvate.—u. Spike ellipsoid, bracts decussate, 5-ranked, little graded.—v. Spike ovoid, bracts spirally imbricate, lowest pair of bracts distinctly longer than the fertile bracts.—w. Spike obovoid, sterile bracts many, grading gradually into the fertile bracts.

surfaces are variously pigmented, smooth to variously rugose, with raised or sunken or flush stomates, or even quite pubescent (Fig. IId–p). Most of such external characters have long been noted in the literature, particularly by G. O. A. Malme, A. Nilsson, M. Seubert, and others in the late 19th and early 20th centuries.

Xyris plants have scapes arising in axillary fashion enfolded in closed-based, distally open and bladed scape sheaths. The scapes are also quite diverse, usually terete and solid basally and variously multicostate. Distally they vary the most, from terete and ecostate to multicostate, variously flattened, even ancipital; they range from smooth to variously scabrid or ciliate, particularly on the costae (Fig. IIq–w).

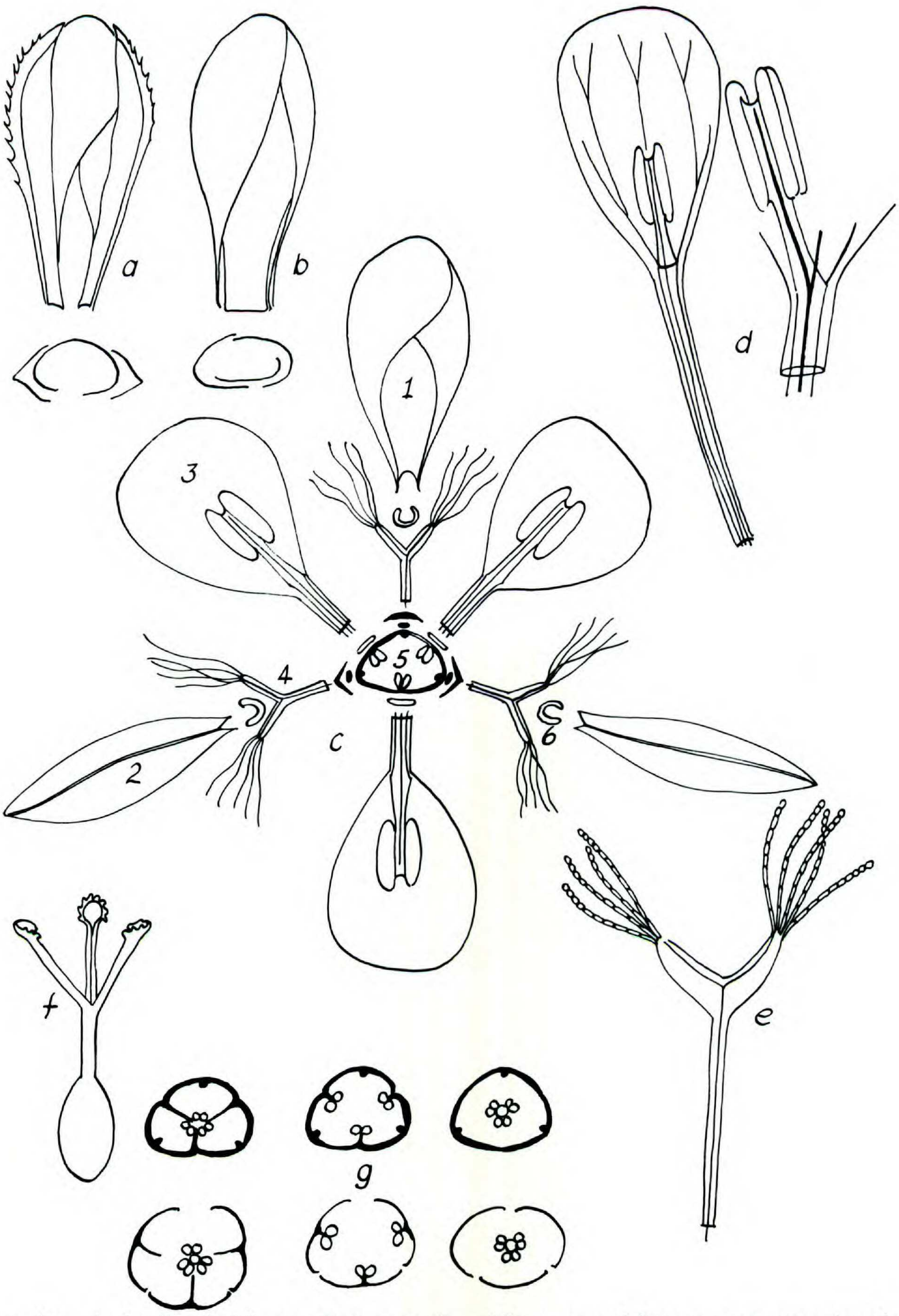
Usually the scape terminates in a single spike (most exceptions being either the Guayanan *X. bicephala* Gleason or anomalous examples). The spike is mostly conelike with either spirally or decussately imbricate bracts. Subsections have been developed on the character of the bracts. One direction of evolution has been toward species with the lower bracts elongate, even leaflike (*X. cipoensis*, *X. hystrix*, *X. involucrata*, *X. uleana*, etc.) with the fertile bracts much shorter and abruptly reduced. Another is toward sterile bracts few at the spike base, somewhat larger than the fertile bracts and transitional to them. A third trend has been for sterile bracts to be many, the lowermost very small, gradually passing into the larger fertile ones. The commonest condition is for there to be a few sterile bracts somewhat smaller than the spirally imbricate fertile ones. Significant also is a bract zone that may run the length of the midbract or be variously apical, the dorsal area. Doubtlessly homologous to the leaf blade in *Xyris*, this is frequently photosynthetic and is mostly distinctly different from the usually chaffy bract matrix. As mentioned above, some bracts in *Xyris* are elongated and may have blades, and when this is so, such are mostly extensions of dorsal area tissue, or at least of midrib tissue (Fig. IVa–h). Bracts on yet other species may lack a dorsal area, and a few species may be versatile in this character. Some examples of *X. tenella* Kunth have bracts with and others without dorsal areas on the same plant, or may have them on the sterile bracts but lack them on the fertile ones. Backs of bracts also vary considerably, from rounded-convex and ecostate (carinate) to strongly folded, navicular, or costate, while the usually thin edges vary from strongly bordered and variously ciliate, lacerate, or fimbriate to entire.

In the axils of the fertile bracts the flowers are solitary, the axis of the indeterminate inflorescence being contracted and headlike or conelike, or quite elongate (as in *X. stenostachya* Steyerm., the most extreme). These flowers are conspicuous at anthesis, usually but a few hours for a single bloom, a given spike producing usually only one or two flowers simultaneously (in the species with contracted spikes several flowers may be open at once, e.g., *X. involucrata* Nees).

A dissection of the flower bud just prior to its expansion is the best approach to understanding the *Xyris* flower (Fig. IIIa–f). The usual *Xyris* bud is narrowly obovoid and planoconvex. There are three sepals. The lateral sepals are boatlike, their keels directed outward, their concave sides clasping the edges of the compressed corolla bud as well as the edges of the inner (dorsal) sepal, which forms a cap over the corolla with its two edges overlapping on the ventral side. The lateral sepals (Fig. IVl, m) are the bonanza for xyridologists in that they vary little from biotype to biotype in a species. In most cases they are free; in fewer instances they are connate;

→

FIGURE III. *Flower and fruit structure.—a. Ventral and cross-sectional view of sepals in bud, lateral sepals enfolding inner (dorsal) thin sepal.—b. Ventral and cross-sectional view of petals in bud, lateral petals enfolding ventral petal.—c. "Exploded"* Xyris *flower. 1. disarticulated dorsal sepal; 2. lateral sepals; 3. petal blades (claws foreshortened) with adnate stamens; 4. staminodia, claws foreshortened, showing flattened, bifurcate*



blades and terminal tufts of trichomes; 5. cross section of flower toward base as parts are oriented in bud, placentation parietal; 6. stylar apex, showing horseshoelike stigma pattern at about level of staminode tip.—d. At left petal blade, claw, adnate stamen (note 3 traces in claw); at right an upper sector of petal claw, oblique view showing branching of median claw trace: one branch into filament base, the other forward into mid-base of petal blade.—e. Staminode showing yokelike blade, bifurcated trace, and moniliform staminodial beard hairs.—f. Gynoecium, showing style base, tubular style branches, and stigmas.—g. Placentation types. Left rank: above—axile placentation in ovary; below—cross section of dehiscing fruit showing septa pulling away from axis. Middle rank: above—parietal placentation in ovary; below—cross section of dehiscing fruit. Right rank: above—central placentation in ovary; below—cross section of dehiscing fruit, valves lacking septa.

very infrequently they may be free toward a spike base, increasingly connate toward that spike apex (e.g., the *X. thysanolepis* complex). The sides of a lateral sepal are mostly very thin; in some cases they are equal or approximately so, and the sepal is equilateral; in fewer instances they are inequilateral (Fig. IVi, j). In all cases the sepal has a midrib (costa or carinal keel) that usually conforms with the angle of the sepal fold; in some cases this keel is thick and firm, made up of many strands of cells oriented longitudinally and breaking outward. The crest of such keels may range from entire to variously scabrid or ciliate (Fig. IVl). In other cases the keel may be produced into a sheet of cells one layer thick, its border made up of simple or compound strands of cells, these forming a lacerate or fimbriate outline (Fig. IVm). The best stage for seeing these characters comes after mature fruit has just formed and the sepals are hardened to produce a typical border.

At anthesis the outer (dorsal) sepal abscisses, falling away calyptralike as the corolla expands (Fig. IIIa). In the bud, the anterior (inner) petal is enfolded by the right (observing the bud from the adaxial side) edge of the left lateral petal and is enfolded by the left edge of the other lateral petal, the right edge of which overlaps the right side of the ventral (inner) petal (Fig. IIIb). All petals are roughly equal in size and usually separate to the base. Each has a long claw and a broad, usually yellow (in Africa there are blue-flowered species) spreading blade, this of a distinctive outline and apical border. There are three functional stamens adnate along the length of the claw. What appear to be three traces run the length of the claw, but the median trace is compound, branching at the blade base, the adaxial branch departing into the divergent filament base and going up into the anther connective (Fig. IIId), the dorsal branch supplying the middle of the petal blade.

Xyris anthers are mostly tetrasporangiate and bilocular, variously separated by a flattened connective, usually bifid distally, and sagittate proximally; their dehiscence is longitudinal, either lateral or extrorse. Alternating with the petal claws and slightly inside them is a whorl of three staminodes in most *Xyris* flowers (in a few these are reduced to nubs of tissue at the floral base or are totally absent, e.g., *X. savanensis* Miq.). The staminode is usually made up of an elongate slender claw about as long as the petal claw, and a yokelike flattened blade wherein the single trace bifurcates, tailing out toward the spreading staminodial branch tip, where there are usually borders of slender, moniliform hairs. The character of the cells making up the beard hairs deserves more attention than it has gotten heretofore and may well be reliable to determine complexes of species (Fig. IIIc-4, e). The ovary is superior, the style tubular, branching midway into three subequal branches whose involute edges are pollen receptive distally. Placentation varies; in most *Nematopus* it is either plainly basal with a brush of long funiculi or free-central with shorter, ascending funiculi. In other *Xyris* the placentation is plainly parietal or appears marginal. But in a significant number of Guayanan species it may be axile and the ovary distinctly trilocular, or it may be axile toward the base and parietal upward in the ovary, or the septa may pull away so that the axis is left with the ovules (Fig. IIIg).

The fruit is usually thin-valved, though there are some definite exceptions in which the walls are hard. Dehiscence is loculicidal along the dorsal side of the carpel.

The seeds may be few or very numerous, diverse in shape and size, 0.3–5 mm long. The outer integument is usually raised into a variously longitudinally ribbed, sometimes also cross-lined surface which is specific in character; distally it may form an empty ribbed beak or it may separate into a crown of narrow scales (e.g., *X. teinosperma* Idrobo & Smith). The contents of the seed are a starchy and proteinaceous, translucent or farinose endosperm and a small basal–lateral embryo.

The type for the genus is *Xyris indica* L. This was based by Linnaeus on an east Indian element and a North American element. J. E. Smith (*Rees' Cycl.* 39. 1818) designated

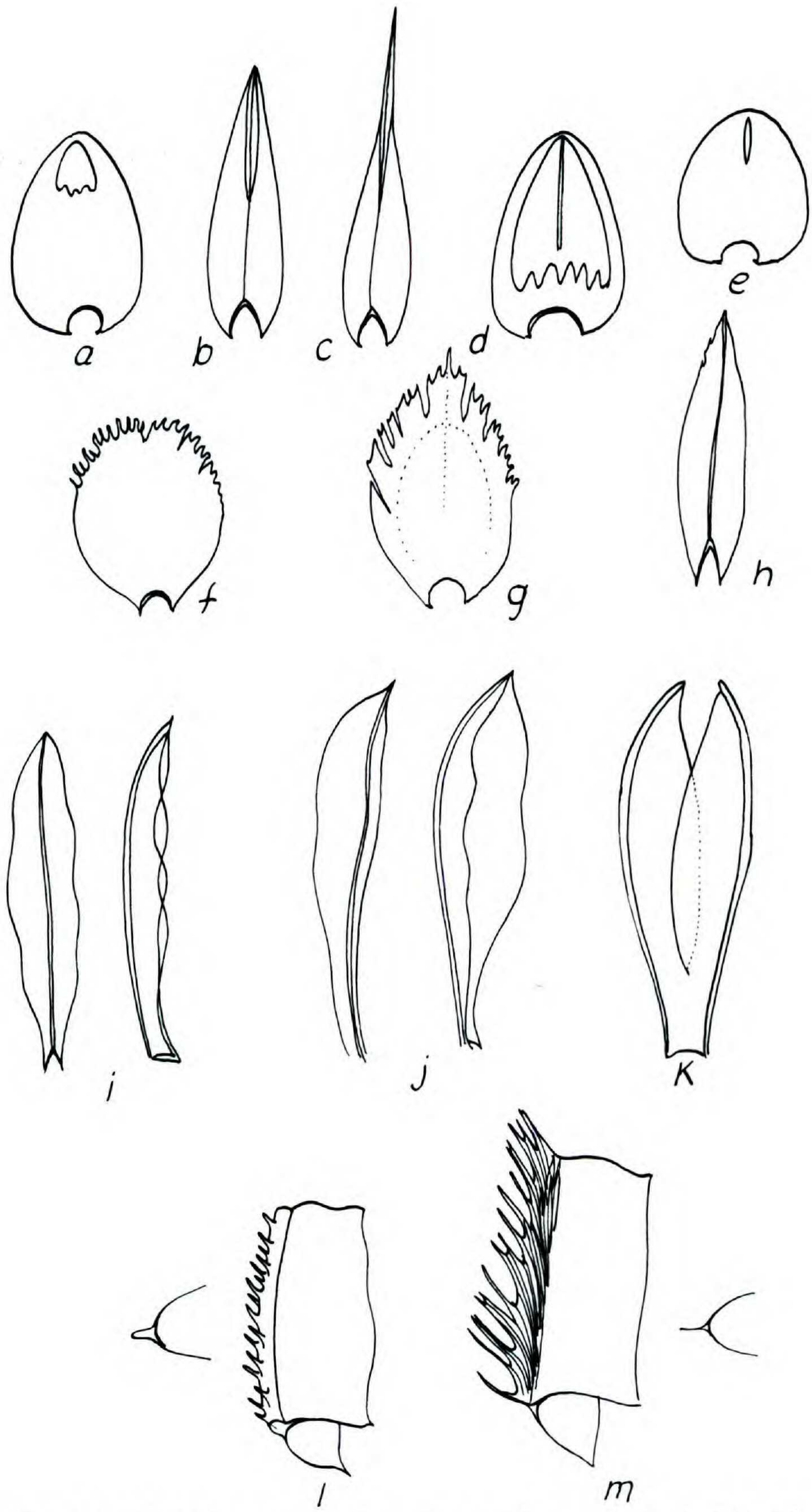


FIGURE IV. *Bract and lateral sepal types.—a. Ovate bract with ovate, subapical dorsal area.—b. Lanciform bract, keeled, with elliptic-linear dorsal area.—c. Lanciform bract, keeled, bladed, the blade comprising a cusp and dorsal area.—d. Ovate bract, mostly dorsal area, the convex bract medially-apically carinate.—e. Broadly ovate bract with narrow, subapical dorsal area.—f. Broadly obovate bract, border thin, lacerate; dorsal area lacking.—g. Broadly elliptic bract, border thin, laciniate, friable; dorsal area lacking.—h. Lanceolate bract, keeled; dorsal area lacking.—i. Dorsal and lateral views of lateral sepal, this oblong-elliptic, equilateral, slightly curvate, with narrow, thick, entire keel.—j. Dorsal and lateral views of lateral sepal, this oblanceolate, inequilateral, with narrow, thick, entire keel.—k. Connate lateral sepals.—l. Midsector of lateral sepal showing thickened, scabro-ciliate keel.—m. Midsector of lateral sepal showing thin (made up of a single layer of cells), ciliate-fimbriate keel.*

the Indian element as *X. indica* while using the North American element for *X. torta* Smith.

In the key below, the characters are based on principal leaves from healthy plants, spikes at seeding time, lateral sepals at seeding time, and on mature fruit and seed. Any attempt to determine sterile or depauperate material, or specimens with immature flowers, fruit, or seed is virtually impossible in a group of this sort.

The key below applies primarily to the *Xyris* of Venezuela, Colombia, and the Guianas. Some taxa discovered in contiguous Brazil, if in habitat likely to be found in Venezuela and the Guianas, are likewise included.

The key applies to healthy material with normally developed, seeding spikes. Principal, not juvenile, leaves are to be used. Overlaps in variation—particularly in trichome characters, lateral sepal and dorsal area color or accrescence, and plant pigmentation—often have necessitated the same species coming out in two or more leads.

KEY TO *XYRIS* OF GUAYANA AND AMAZONIAN NORTHERN SOUTH AMERICA

I. Placentation evidently marginal or parietal, the capsule valves on dehiscence retaining placentae and seeds ..... Section *Xyris* (conventional)

II. Placentation free-central or basal or apparently axile, capsule valves on dehiscence with or without septa, but not retaining seeds ..... other *Xyris*

I. Section *Xyris* (conventional).

1a. Keel of lateral sepals at least in part lacerate or irregular.
  2a. Seeds fully 1 mm long; dorsal area venose and/or midnerve conspicuous; scapes terete distally with (usually) 3 or more strong costae, occasionally multistriate; leaf sheath sometimes long-ciliate.
    3a. Principal foliage leaves longer than scape sheaths; spike bracts when dry inrolling and excurving, all with tips lacking tufts of long trichomes ..... 1. *X. fallax*
    3b. Principal foliage leaves poorly developed, exceeded by scape sheaths; spike bracts when dry not excurving, the lower ones with apical tufts of slender trichomes ..... 6. *X. brachyfolia*
  2b. Seeds 0.4–0.8(–0.9) mm long; dorsal area not venose or costate as in above; scapes seldom more than bicostate; leaf sheath never ciliate.
    4a. Plant base strongly tinged with red or purple; scapes ecostate distally or with costae smooth; seeds fusiform or narrowly ellipsoid, mostly opaque, dark-ribbed, farinous, 0.7–0.9 mm long; plants perennial ..... 2. *X. laxifolia*
    4b. Plant base greenish, stramineous, dull brown or tan; scapes always with 1–2 (rarely a few more) costae, these usually papillose or scaberulous; seeds ovoid or broadly ellipsoid, amber, translucent, 0.4–0.7 mm long; plants annual ..... 3. *X. jupicai*
1b. Keel of lateral sepals either ciliate or entire.
  5a. Lateral sepals with keel ciliate; bracts dark dull brown, at maturity strongly spreading, the dorsal area unkeeled, paler but indistinct ..... 4. *X. navicularis*
  5b. Lateral sepals with keel eciliate, entire; bracts pale greenish tan, lustrous, the indistinct dorsal areas strongly keeled ..... 5. *X. anceps*

II. Other *Xyris*.

1a. Margins of leaf sheaths entire.
  2a. Plants mostly densely cespitose, evidently perennial; leaf sheaths hard, lustrous, castaneous to reddish brown, usually in strong contrast to leaf blades both in color and texture.
    3a. Leaf blades not flattened or 2-edged, for most of their length either terete or very thickened and deeply ribbed and sulcate; ligules prominent, abruptly narrowed to blades.
      4a. Dorsal area distinguishable.
        5a. Plant bases nearly black ..... 7. *X. neblinae*
        5b. Plant bases deep brown, pale brown, or reddish brown.
          6a. Mature spikes mostly over 1.5 cm long, fusiform or distinctly broadest above middle; leaf blades at least 1 mm thick ..... 8. *X. juncifolia*
          6b. Mature spikes mostly under 1.5 cm long, ovoid to cylindrical or subglobose; leaf blades less than 1 mm thick.
            7a. Bract edges densely pale-villose; plants lacking stout, scaly rhizomes ..... 9. *X. lanulobractea*
            7b. Bract edges not densely pale-villose; plants with short, stout, ascending, scaly rhizomes ..... 10. *X. terrestris*

4b. Dorsal area imperceptible.
8a. Leaf blades and upper sheaths coarsely ribbed and sulcate; sheath bases brown (bases of blades and apices of sheaths mostly rose-purple) ..... 11. *X. scabridula*
8b. Leaf blades not deeply ribbed and sulcate; sheath bases (usually tips also) nearly black ..... 12. *X. atriceps*
3b. Leaf blades flattened, for most of their length 2-edged, the edges either thickened or sharp; ligules evident or not.
9a. Dorsal area evident.
10a. Scapes strongly flattened, at least 2–2.5 mm broad distally, ancipital.
11a. Several bracts leaflike, forming an involucre ..... 13. *X. involucrata*
11b. No bracts leaflike.
12a. Scapes bispicate; seeds under 2 mm long ..... 15. *X. bicephala*
12b. Scapes unispicate; seeds over 2 mm long ..... 16. *X. teinosperma*
10b. Scapes distally round or if strongly flattened distally not as wide as 2 mm there, not ancipital.
13a. Lowermost sterile bracts distinctly shorter than the fertile ones and grading gradually into them.
14a. Leaf blade edge cartilaginous-thickened, entire or ciliolate; bract borders pale villosulous (low-elevation savanna) ..... 17. *X. lomatophylla*
14b. Leaf blade edge not cartilaginous-bordered, smooth; bract borders not pale villosulous, sometimes sparsely short-brown ciliolate ..... 18. *X. contracta*
13b. Lowermost sterile bracts as long as or longer than the fertile ones.
15a. Lateral sepals connate, crested with a red villous keel apex; plants glaucous; dorsal area of lowest 1–2 bracts often excurrent as a green blade ..... 19. *X. seubertii*
15b. Lateral sepals free, not crested as above; plants not glaucous; dorsal areas bladeless.
16a. Dorsal area large, triangular, punctate, occupying most of bract above middle; low-elevation savanna or granite outcrops, T. F. Amazonas, Venezuela.
17a. Bract borders reddish, long-ciliate; keel of lateral sepals and leaf blade edges ciliate; seeds 1.3–1.4 mm long ..... 20. *X. huberi*
17b. Bract borders not reddish, eciliate; keel of lateral sepals sparsely scabrid and leaf blade edges scabrociliate only toward base; seeds ca. 0.5 mm long ..... 21. *X. graniticola*
16b. Dorsal area narrower, less conspicuous, not evidently punctate; high savanna of tepuis ..... 22. *X. frondosa*
9b. Dorsal area not evident.
18a. Longest leaves rarely with sheaths over ½ as long as blades, mostly ⅓ as long or shorter.
19a. Leaf blades under 3 mm wide.
20a. Keel of lateral sepals toward apex red villous-ciliate; edges of young bracts toward apex red villose ..... 23. *X. chimantae*
20b. Keel of lateral sepals ciliate or lacerate but not as above; bract tips entire or brown ciliolate.
21a. Tips of leaf blades strongly callused, thick, blunt; leaf blades coarsely few-ribbed; high tepuis of Amazonas.
22a. Foliage smooth; leaf sheath apex tan to stramineous, lustrous; sheath edge forming a strong, broad ligule apically; keel of lateral sepals narrow, entire or subentire ..... 24. *X. stenophylloides*
22b. Foliage harsh, particularly leaf blades toward base; leaf sheath apex and blade bases strongly tinged with red or rose; sheath tending gradually to merge with blade base ..... 11. *X. scabridula*
21b. Tips of leaf blades acute or acuminate, sometimes spinulose; leaf blades not coarsely ribbed; high elevations.
23a. Flowers/spike 5–14; lateral sepals inequilateral, the keel long-ciliate above middle ..... 25. *X. columbiana*
23b. Flowers/spike 4 or fewer; lateral sepals subequilateral, the keel either not evident or entire, papillate, or distantly scabrociliate.
24a. Lateral sepals ca. 5 mm long; bracts ovate to orbicular, ecarinate, nearly black; seeds ca. 1 mm long ..... 26. *X. subulata* (complex)
24b. Lateral sepals ca. 7–8 mm long; bracts narrower, carinate, brown; seeds ca. 2 mm long ..... 27. *X. valdeapiculata*
19b. Leaf blades mostly over 3 mm wide.

25a. Scapes ancipital (flattened and sharp-edged) distally, mostly 2.5 mm or more wide (variously scabrid, ciliate, or smooth).
26a. Spikes obovoid or hemispheric, ca. as broad as long or broader; scape edges scabrid; bracts dark lustrous brown (Duida tepui and adjacent highlands) ..... 28. *X. tatei*
26b. Spikes ovoid-cylindric, distinctly longer than wide; scape edges smooth to pale ascending-ciliate; bracts dull, dark greenish black ..... 29. *X. melanovaginata*
25b. Scapes not sharp-edged distally, mostly less than 2.5 mm wide.
27a. Leaf blades with a rusty border, ciliate (often with reddish vein intervals) ..... 30. *X. culmenicola*
27b. Leaf blades without a rusty border, eciliate ..... 31. *X. lugubris*

18b. Longest leaves commonly with sheaths over ½ as long as blades, frequently ⅔ as long or longer.
28a. Basal bracts forming a leafy involucre longer than the spike ..... 14. *X. pallidula*
28b. Basal bracts not forming a leafy involucre.
29a. Bracts toward apex with a scarious, lacerate, pale or reddish border; bases of leaf sheaths abruptly orbicular-dilated.
30a. Scarious bract borders pale to deep red or red-brown; seeds ca. 1 mm long ..... 32. *X. thysanolepis* (complex)
30b. Scarious bract borders almost always pale, off-white; seeds 0.5–0.7 mm long.
31a. Apices of most bracts acute and distinctly folded; stem bases cloaked with very numerous, closely overlapping leaf sheath bases, these a lustrous brown; endemic to summit elevations, Roraima and adjacent tepuis ..... 33. *X. concinna*
31b. Apices of most bracts broader, often broadly rounded; stem bases usually not as elongate, not as above; widely distributed from medium to high elevations ..... 34. *X. hymenachne*
29b. Bracts not bordered as above; bases of leaf sheaths not abruptly orbicular-dilated.
32a. Scapes ancipital and strongly ciliate distally.
33a. Scapes bispicate ..... 15. *X. bicephala*
33b. Scapes unispicate.
34a. Hairs of leaf and scape edges rusty, forming a dense border; apices of leaves erect; seeds ca. 1.5 mm long.
35a. Main stems rebranching, the branches elongate, forming frondlike plates of leaves; tips of leaves narrowly acute; spikes ellipsoid or obovoid ..... 38. *X. ptariana* (extreme)
35b. Main stems not rebranching; tips of leaves rounded; spikes hemispheric or subglobose ..... 35. *X. decussata*
34b. Hairs of leaf and scape pale, usually white or blonde; apices of leaves various; seeds various.
36a. Seeds at least 2 mm long; spikes hemispheric or subglobose; bracts very lustrous with subcucullate tips; tips of most leaves incurved-blunt ..... 36. *X. albescens*
36b. Seeds ca. 1.5 mm long; spikes obovoid or oblong; bracts dull, sooty brown, with flat tips; tips of most leaves erect and acute ..... 37. *X. fuliginea*
32b. Scapes ancipital or not, never ciliate, at most scabridulous along edges; stems forming frondlike plates of leaves (like giant *Fissidens*).
37a. Spikes 1.5 cm long or shorter, ovoid or broadly obovoid; lateral sepals under 1 cm long, strongly curved, blunt.
38a. Ligular apex often excurved; scapes strongly flattened distally, mostly 2.5 mm broad or wider; leaf blades commonly over 4 mm wide ..... 38. *X. ptariana*
38b. Ligular apex commonly erect or ascending; scapes narrower, usually 2 mm broad or narrower distally; leaf blades usually under 4 mm wide ..... 39. *X. witsenioides*
37b. Spikes mostly 2–2.5 cm long, ellipsoid-cylindric or narrowly obovoid; lateral sepals over 1 cm long, narrowly acute ..... 40. *X. xiphophylla*

2b. Plants either aquatic perennials or short-lived perennials or annuals of low- or moderate-elevation savanna, mostly low of habit and slender-scaped, and with small or narrow spikes; leaf sheaths mostly softer, paler, their bases not in sharp contrast to blades in color and texture.
39a. Scapes ancipital, edges at least in combination broader than the scape body; dorsal area and midrib of at least one of the lowest sterile bracts excurrent as a strong cusp or blade (body of lower bracts with a strong keel).
40a. Basal bracts foliaceous, slightly to much longer than the fertile bracts, sharply alate-keeled, spreading or ascending and often forming an involucre; sepals acute ..... 41. *X. spruceana*
40b. Basal bracts tending to be incurved, cucullate, the lowest slightly to much longer than the fertile bracts, thus spikes not as noticeably involucrate and spreading-foliaceous; sepals obtuse ..... 42. *X. uleana* (complex)
39b. Scapes flattened or terete, but not winged as above; lowest bracts shorter in relation to fertile bracts.
41a. Florets 4 or fewer.
42a. Lateral sepals connate.
43a. Fertile florets 1 per spike.
44a. Leaf blades with edges cartilaginous-thickened; scapes flattened distally with costae making edges ..... 44. *X. esmeraldae*
44b. Leaf blades filiform, the edges not noticeably cartilaginous-thickened; scapes filiform-terete, ecostate ..... 45. *X. subuniflora*
43b. Fertile florets more than 1 per spike ..... 46. *X. connosepala*
42b. Lateral sepals free.
45a. Leaf blades strongly flattened, with narrow, pale, incrassate borders ..... 47. *X. guianensis*
45b. Leaf blades terete or somewhat flattened, without pale, incrassate borders.
46a. Leaf sheath apically with a broad ligule, this narrowing abruptly to a terete blade; spikes frequently proliferous; aquatic or emergent plants with foliage often maroon and soft ..... 48. *X. spathacea*
46b. Leaf sheath with borders narrowing more gradually to a more flattened, often strongly ribbed blade; spikes not proliferous.
47a. Mature scapes equalled or exceeded by larger leaves; bracts at maturity strongly excurved, thus spikes broadly turbinate ..... 49. *X. cyperoides*
47b. Mature scapes definitely longer than leaves; bracts and spikes not as above.
48a. Seeds ca. 1 mm long, including an apical pale coma of short squamellae; scapes and leaf blades rugose or rugulose ..... 58. *X. mima*
48b. Seeds 0.4–0.7 mm long, lacking apical squamellae; scapes and leaf blades smooth or nearly so.
49a. Lateral sepals narrow, acute, entire; bract tips acute, with narrow dorsal areas ..... 50. *X. toronoana*
49b. Lateral sepals broad, ciliate or ciliolate; bract tips broader, with broader dorsal areas (see no. 47).
41b. Florets 4–many.
50a. Leaf blades filiform and flaccid; sheath bases broadly scarious-bordered, the scarious borders distally producing a strong ligule much broader than the leaf blade base; rhizomatous soft aquatics or marsh emergents.
51a. Leaf blade terete; scapes arising from long, stout, scaly rhizomes; seeds ca. 0.5 mm long ..... 51. *X. aquatica*
51b. Leaf blade flattened, strongly nerved; scapes arising from slender rhizomes; seeds ca. 1 mm long ..... 52. *X. apureana*
50b. Leaf blades wider and/or firmer; sheath at apex not as above; erhizomatous plants of drier sites.
52a. Spike elongate, more than 4 times as long as wide.
53a. Bracts distichous, spikes flattened ..... 53. *X. stenostachya*
53b. Bracts polystichous, spikes terete.
54a. Leaf blades at least toward base with thickened, lustrous cartilaginous margins; leaf sheath keels distally with cartilaginous dark costa.
55a. Spikes sharply acute, fusiform or ellipsoid; seeds 1.2–1.7 mm long ..... 54. *X. stenocephala*
55b. Spikes blunt, the mature ones cylindric; seeds 0.6–0.7 mm long ..... 55. *X. cylindrostachya*

54b. Leaf blades lacking thickened, lustrous, cartilaginous margins; leaf sheath keels lacking cartilaginous dark costa.
56a. Spike lanceoloid to fusiform, acuminate; fertile bracts at apex with lanceolate dorsal area forming a sharp subapical keel; leaf blades terete most of their length above base ..... 56. *X. brachysepala*
56b. Spike ovoid to ellipsoid, lanceoloid, or cylindric, blunt or acute; fertile bracts with broad dorsal areas not forming a sharp subapical keel; leaf blades usually terete only at or toward tips (if at all) ..... 57. *X. paraensis* (complex)

52b. Spikes of a broader, shorter outline.
57a. Lateral sepals subequilateral or slightly inequilateral.
58a. Scapes scabrid, tuberculate-rugose, strongly bicostate distally; seeds apically with coma of pale, narrow scales ..... 58. *X. mima*
58b. Scapes smooth or at most papillate, usually ecostate or at most striate; seeds without coma.
59a. Spikes broadest at or above middle; leaf blades with strong red border; lateral sepals strongly curved, the keel evenly ciliate ..... 59. *X. rubrolimbata*
59b. Spikes ovoid, acute; leaf blades lacking strong red border; lateral sepals not strongly curved, the narrow keel entire or subentire ..... 60. *X. cuatrecasana*
57b. Lateral sepals either connate or very inequilateral.
60a. The lateral sepals connate; fertile bracts pectinate-bordered ..... 61. *X. pectinata*
60b. The lateral sepals free; fertile bracts not pectinate-bordered.
61a. Staminodia lacking beard; foliage prevalently (one var. excepted) papillose or rugulose, the leaf blades strongly nerved; dorsal areas of fertile bracts mostly narrowly elliptic or linear; seed tips truncate, with a central low apiculus ..... 62. *X. savanensis*
61b. Staminodia bearded; foliage prevalently smooth, the leaf blades either less strongly nerved or smooth; dorsal areas of fertile bracts broader or more raised; seed tips not truncate.
62a. Backs of bracts strongly papillose-tuberculate; bract edges at least apically villous or pilose-ciliate.
63a. Lowest pair of bracts incurved-cucullate at tips not much if at all exceeding spike ..... 42. *X. uleana* (complex)
63b. Lowest pair of bracts with spreading, trigonous-subulate tips many times longer than spike ..... 43. *X. calderonii*
62b. Backs and edges of bracts smooth and entire.
64a. Leaf blades with cartilaginous-thickened borders; seeds 1.2–1.7 mm long ..... 54. *X. stenocephala*
64b. Leaf blades without cartilaginous-thickened borders; seeds less than 1 mm long ..... 57. *X. paraensis* (complex)

1b. Margins of leaf sheaths at some or all levels variously ciliate with various sorts of hairs.
65a. Dorsal area evident on some or all spike bracts.
66a. Leaves at junction of sheath and blade definitely flattened.
67a. Scapes either strongly flattened distally or with 2 costae making 2 strong edges.
68a. Leaf blade edges and/or scape edges usually with long, straight cilia, rarely smooth, if so then thickened.
69a. Spikes broad; dorsal area broadly triangular, occupying most of upper part of bract; scapes mostly 2 mm wide or more ..... 63. *X. surinamensis*
69b. Spikes narrow; dorsal area narrower; scape narrower ..... 64. *X. pratensis*
68b. Leaf blade and scape edges scabrociliate with shorter, stiffer hairs ... 65. *X. bicostata*
67b. Scapes distally terete or at least thickened in cross section, 0–many-costate, costae in bicostate types not ciliate or scabrociliate, not making 2 strong edges.
70a. Scapes smooth, without strong costae or merely fluted
71a. Flowers usually more than 4.
72a. Bracts, or some of them, with long hairs on margins or backs or on both.

73a. Bracts rounded, edges villous-ciliate ..... 66. *X. globosa*
73b. Bracts acute, some bract backs with white hairs ..... 67. *X. arachnoidea*

72b. Bracts without pubescent margins or backs.
74a. Matrix of bracts (at level of dorsal areas) pale brown or pale red-brown, thin, lacerate or entire.
75a. Leaf sheath bases abruptly dilated; plant base thus bulbous.
76a. Fertile bracts apically carinate, acute; leaf blades coarsely few-nerved ..... 69. *X. araracuare*
76b. Fertile bracts more rounded, less carinate at apex; leaf blades more flattened, less coarsely nerved ..... 70. *X. lacerata*
75b. Leaf sheath bases not abruptly dilated; plant base not bulbous (spike oblate, often proliferous) ..... 71. *X. oblata*
74b. Matrix of bracts dark brown, spikes dark; scapes usually lustrous, deep brown or olivaceous or reddish (leaf tip excentrically spinulose) ..... 81. *X. setigera* (complex)
71b. Flowers almost always 4 or fewer (spikes mostly narrow; dorsal area narrow, often streaklike, absent on some bracts).
77a. Sheath cilia long and spreading but firm; seeds ovoid, ca. 0.5 mm long; leaf blades linear ..... 72. *X. tenella* (complex)
77b. Sheath cilia arachnoid; seeds ellipsoid or cylindric, ca. 1 mm long; leaf blades filiform ..... 73. *X. byssacea*
70b. Scapes with strong costae.
78a. Scapes sharply 3-or-more-costate; plant base sub-bulbous; spike broadly ovoid or ellipsoid ..... 68. *X. malmeana*
78b. Scapes with costae fewer if multicostate; papillate-scabrid plant base not bulbous (the plants annual and low); spike ellipsoid to lanceoloid ..... 72. *X. tenella* (complex)

66b. Leaves at junction of sheath and blade definitely not flattened, at most elliptic in cross section, mostly terete or oval, often with a ventral sulcus.
79a. Spikes few-flowered and narrow (narrowly oblong to linear-lanceoloid).
80a. One pair of lower (sterile) bracts longer than the rest and connivent over spike top ..... 74. *X. cryptantha*
80b. Lower bracts not as above, the lowest pair slightly to considerably shorter than the spike ..... 75. *X. oxylepis*
79b. Spikes several–many-flowered and broader.
81a. Bract tips narrowly or bluntly acute.
82a. Outer bracts densely hirsute-tomentose or hirsute-ciliate with white hairs; bract tips straight, erect or ascending, bract matrix dark-castaneous ..... 76. *X. wurdackii*
82b. Outer bracts not hirsute-tomentose or hirsute-ciliate, mostly smooth; bract tips becoming excurved, bract matrix brown ..... 77. *X. frequens*
81b. Bract tips broadly angled to rounded.
83a. Dorsal area broad, comprising most of the bract above middle; leaves strongly angulately ribbed; mostly plants of low-altitude savanna ..... 78. *X. subglabrata*
83b. Dorsal area narrower; leaves not strongly ribbed; mostly plants of medium- to high-altitude tepuis.
84a. Scapes smooth, usually lustrous, at most punctate.
85a. Bracts dark brown or dark red-brown, dorsal areas pale and inconspicuous ..... 81. *X. setigera* (complex)
85b. Bracts pale brown with darker dorsal areas ..... 79. *X. lithophila*
84b. Scapes papillate or tuberculate, usually rugulose or rugose, at least above middle ..... 80. *X. carinata*

65b. Dorsal area not evident.
86a. Leaves distinctly compressed at junction of sheath and blade, with the ventral edges about as narrow as the dorsal edge.
87a. Scapes terete distally, ecostate, smooth and also punctate; leaf apex usually excentrically spinulose-tipped.
88a. Leaves 0.5–3 mm wide; lateral sepals 5–6 mm long; seeds 0.5–0.6 mm long ..... 81. *X. setigera* (complex)
88b. Leaves 2–3 mm wide; lateral sepals 6.5–7 mm long; seeds 0.9–1 mm long ..... 82. *X. riparia*
87b. Scapes terete or somewhat flattened distally, there costate, usually tuberculate-scabrid, ciliate, papillose and/or rugulose at least on the costae; leaf apex not excentrically spinulose-subulate.

89a. Bracts with scarious and lacerate borders different abruptly in texture and color from main bract body.
90a. Borders of bracts red or red-brown.
91a. Spikes ellipsoid to broad-cylindric; foliage above dilated base yellow-green, scabrid-papillose-rugulose; scapes ancipital distally ..... 83. *X. roraimae*
91b. Spikes broadly obovoid or turbinate to subglobose; foliage except for leaf edges and costae not yellow-green, smooth; scapes not ancipital ..... 32. *X. thysanolepis* (complex)
90b. Borders of bracts pale.
92a. Apices of bracts, particularly basal and inner ones, acute, folded; spikes ovoid ..... 33. *X. concinna*
92b. Apices of bracts mostly obtuse, not folded; spikes broadly ellipsoid, obovoid, or subglobose ..... 34. *X. hymenachne*
89b. Bracts very dark, usually deep olive-brown, the borders entire and not much contrasting in color.
93a. Surfaces of leaves and scapes completely rugulose-papillose-tuberculate.
94a. Lateral sepals all free; capsule valves with strong septa ..... 84. *X. schneeana*
94b. Lateral sepals connate; capsule valves lacking septa ..... 85. *X. consolida*
93b. Surfaces of leaves and scapes smooth or at most papillate only toward leaf sheath base, but edges of leaf blades and of ancipital scape white-ciliolate; lateral sepals free, capsule valves with septa ..... 86. *X. kukenaniana*
86b. Leaves definitely thickened at junction of sheath and blade, not 2-edged.
95a. Tips of leaf blades blunt; scapes rugose-tuberculate or rugulose-papillate ..... 87. *X. delicatula*
95b. Tips of leaf blades subulate-spinulose; scapes totally smooth, or smooth and puncticulate ..... 81. *X. setigera* (complex)

1. Xyris fallax Malme, Bih. Svensk. Vet.-Akad. Handl. 22, Afd. 3, no. 2: 12, pl. 1, f. 5. 1896. TYPE: Brazil. Mato Grosso: Sta. Anna da Chapada, *G. Malme 1432* (lectotype, S). Figure 1.

X. dolichosperma Lanjouw, Rec. Trav. Bot. Neerl. 34: 488, f. 5. 1937. TYPE: Suriname: in savannis humidis prope Zanderij I, Suriname, *Pulle 39* (holotype, U).

X. erythema Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 12, fig. 1A–F. 1963. TYPE: Guyana: infrequent in wet places, scrub and low forest (8–10 m) on shoulder of east flank above Thompson Camp, 1,418–1,525 m, 10 Aug. 1960, Upper Mazaruni River Basin, Mt. Ayanganna, British Guiana, *S. S. & C. L. Tillett & R. Boyan 45074* (holotype, N; isotype, US).

Low and slender to robust, solitary or cespitose, glabrous or papillose-rugulose perennial to 1 m high, the stems contracted, sometimes perennating by stout (–4 mm thick) horizontal rhizome. Leaves erect to spreading flabellately, (5–)10–30(–40) cm long, often suffused with maroon pigment; sheaths ½ to under ¼ as long as blades, soft, pale lustrous brown, the dilated base entire, multicostate, gradually narrowing and carinate upward, the carina often papillose or ciliate-scabrid, the margins frequently sparsely to densely spreading-pilose-ciliate, gradually narrowing to blade or there producing a broadly triangular, incurved ligule to 2 mm long; blades ensiform-linear, 1–5(–7) mm wide, much flattened, sometimes slightly twisted, the apex narrowly incurved-acute, the margins thin or (usually) lustrous-incrassate, often papillate or minutely scabrociliate, more often smooth. Scape sheaths shorter than main foliage leaves, loosely tubular, multicostate, deep reddish brown proximally, distally opening and broadening, apically with short, erect blades. Scapes straight or somewhat flexuous, twisted, terete and multicostate distally, 1–2 mm thick, the costae smooth or papillate. Spikes lance-cylindric to broadly ellipsoid or ovoid, mostly 1–2 cm long, acute, the base short-attenuate, multiflorous; sterile bracts several, the lowest much smaller than the fertile bracts, narrowly triangular-ovate, carinate, grading gradually upward into the fertile bracts, these mostly broadly ovate or obovate, 5–7 mm long, subentire, apically narrowly rounded, the back with distinct elliptic dorsal areas, convex and ecarinate, the dorsal area bisected by a narrow, low but distinct midnerve. Lateral sepals

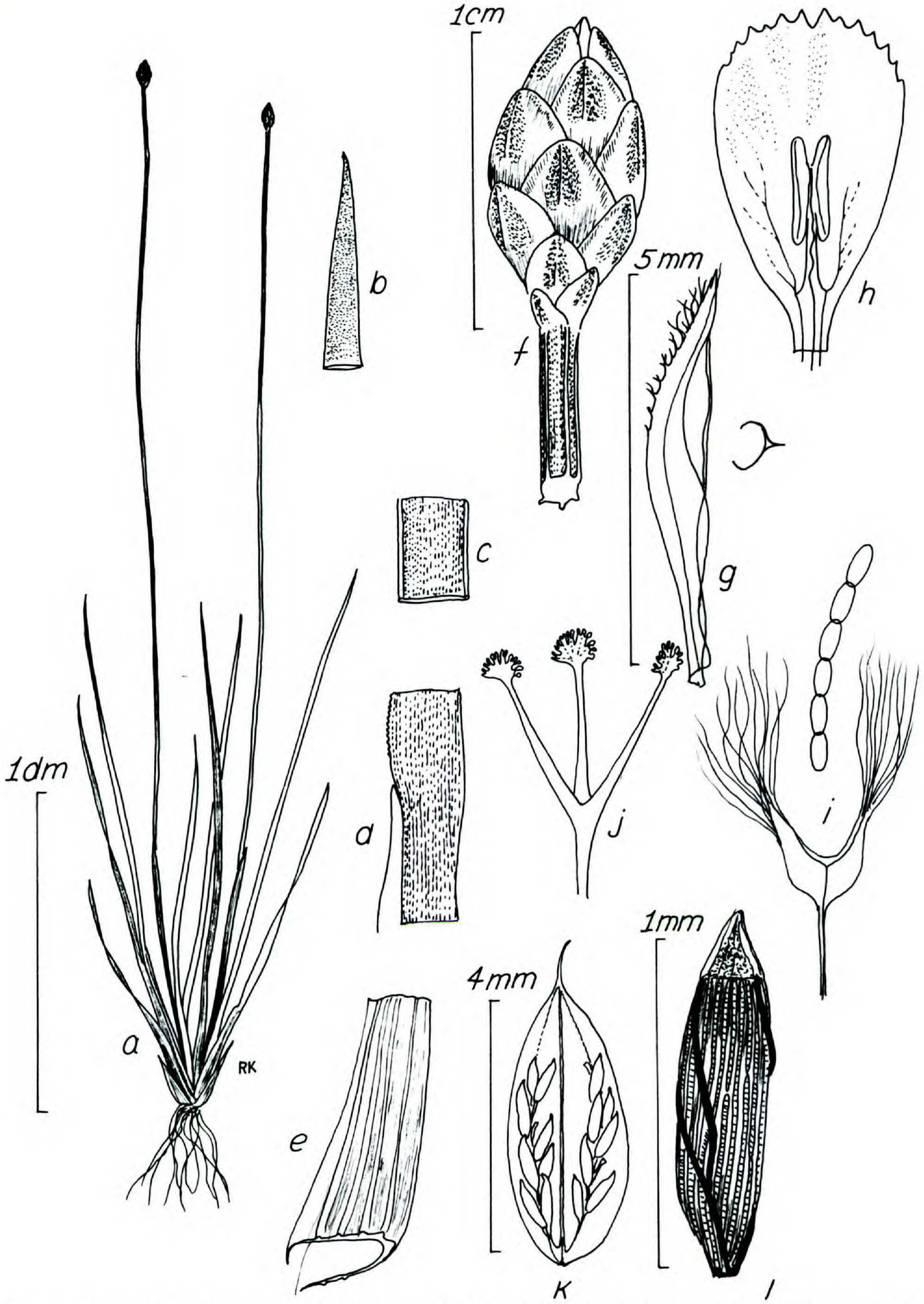


FIGURE 1. Xyris fallax *(*Davidse et al. 1785*)* .—*a. Habit sketch.—b. Leaf tip.—c. Sector of leaf midblade.—d. Leaf base–blade junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged part of beard hair.—j. Stylar apex.—k. Capsule with one valve removed, showing two lines of placentation.—l. Seed.*

free, subequilateral, linear-oblanceolate, 4.5–5 mm long (often much reduced in length even in fruit), acute, red-brown, the firm broad keel lacerociliate from ca. middle to apex, sometimes villous-ciliate at apex. Petal blades unfolding in morning, broadly obovate, 4–5 mm long, yellow, the broadly rounded apex lacerodentate. Staminodia bibrachiate, the broad branches long-penicillate toward tips. Anthers oblong, ca. 1.5 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsule ellipsoid or narrowly obovoid, 3–5 mm long, the placentae parietal and extending ½–⅔ up the ovulary. Seeds numerous, 1–1.5 mm long, asymmetrically cylindrical or fusiform, deep red-brown and translucent, longitudinally distinctly and closely multiribbed, the ribs often crossed or overlain by an occasional broader, deeper-brown rib.

Distribution. Trinidad South to Mato Grosso (Norte), westward into the Andean foothills; Africa.

This xyrid shows weedy tendencies, is often abundant in recently disturbed wetlands, if acid, and along fluctuating shorelines and banks. While commonest in low-elevation savanna, it may be found in wetlands at elevations of nearly 1,500 meters. In ciliation of sheath it varies considerably from totally entire to densely long-brown-ciliate.

2. Xyris laxifolia C. Martius, Fl. Bras. 24(2): 58. 1841. TYPE: Brazil. Without definite locality: Mart. Herb. no. 540 (holotype, M). Figure 2.

?*X. macrocephala* M. Vahl, Enum. Pl. 2: 204. 1805. TYPE: French Guiana, "e Cayenne Vahl" (lectotype, C; this a mixture of *X. ambigua* Beyr. and *X. jupicai* Rich.).

X. macrocephala var. *major* (C. Martius) Nilsson, Kgl. Sv. Vet. Akad. Handl. 24(14): 30. 1892.

X. caroliniana Walt. var. *major* (C. Martius) Idrobo & Smith, Caldasia 6(29): 199, fig. 4. 1954.

X. jupicai Rich. var. *major* (C. Martius) Smith & Downs in Reitz, Fl. Ill. Catarinensis, Pt. 1, fasc. xii: 9. 1965.

Robust, solitary or cespitose perennial 0.5–1.5 m tall, the bases usually suffused with red or purple, all surfaces smooth. Principal leaves erect or spreading flabellately, 4–7 dm long, the sheaths over ½ as long to longer than blades, at very base broad with scarious entire margins, red to purple or charcoal, tapering gradually, keeled into junction with blades, these broadly linear, mostly 1–2 cm wide, strongly flattened, straight, the apex abruptly incurved-acute or erect-acute, the margins thin and hyaline or slightly incrassate, the surfaces deep lustrous green. Scape sheaths shorter than leaves, proximally loosely tubular, multiribbed, deeply tinted with red, purple, or lustrous brown, distally opening and keeled, producing a short, flat, green blade. Scapes straight, stiffly linear, distally terete to oval or elliptic in cross section, sometimes 2-edged but usually ecostate, smooth, green. Spikes ovoid to cylindrical, 3–3.5 cm long, blunt to acute, green-brown, of many tightly and spirally imbricate firm bracts, the sterile ones much smaller than and grading into the fertile ones, keeled, all with distinct and usually greenish dorsal areas; fertile bracts obovate to ovate or suborbicular, convex-backed and ecarinate, 7–10 mm long, apically narrowly rounded, entire, the matrix deep to pale reddish brown, lustrous, in sharp contrast to the paler and dull dorsal areas. Lateral sepals free, oblong-curvate, 5–6.5 mm long, acute, the pale brown, thin sides subequilateral, the dark reddish brown keel wide but thin, lacerate or lacerofimbriate from ca. middle to tip. Petal blades broadly obovate, ca. 5 mm long, yellow, the broadly rounded apex erose, the base broadly cuneate. Staminodia bibrachiate, the broad, flat branches apically rebranched and long-penicillate, the cells congested with dark material, the terminal few often double. Anthers ca. 2.5 mm long, lanceoblong, shallowly bifid, deeply sagittate, on filaments 0.5–0.6 mm long. Capsule planoconvex, broadly to narrowly obovoid, 5.5–6.5 mm long, often longer than the sepals; placentation parietal. Seeds ellipsoid-fusiform, 0.7–0.9 mm long, slightly to conspicuously farinose or translucent, with 6–8 conspicuous, minutely pebbled, dark, longitudinal ribs and many slightly less prominent cross-lines.

Distribution. Southern Mexico southward through Central America and at the

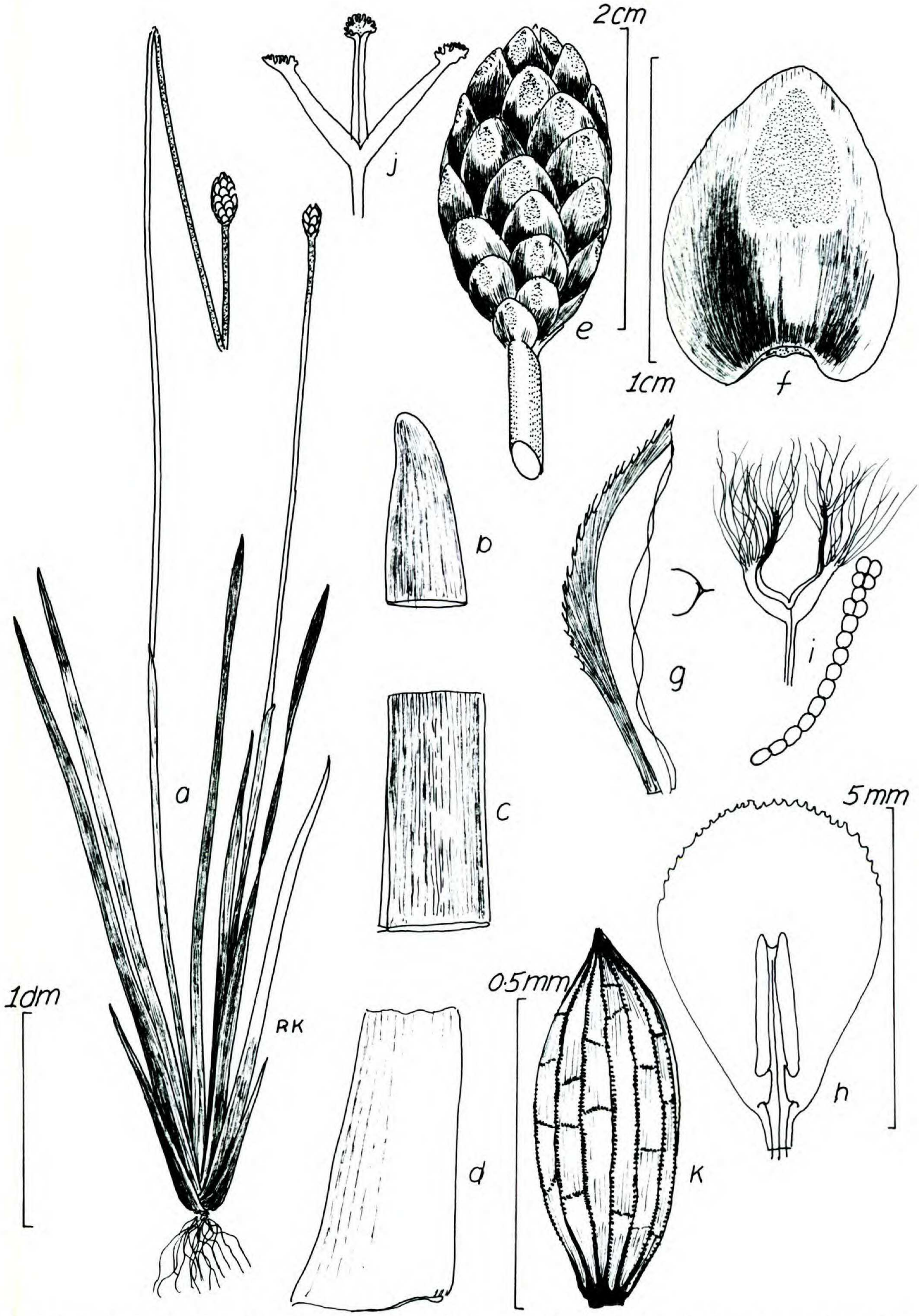


FIGURE 2. Xyris laxifolia *(*Davidse & Gonzales 15946*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Seed.*

lower elevations south into Argentina. Coastal Plain of the southeastern United States (var. *iridifolia*).

The specimen sent from C in the type folder representing *X. macrocephala* Vahl and bearing Vahl's identification as *X. macrocephala* (Vahl script) should bear the oldest name for this species. However, the sheet has two elements on it: one is a spike of *X. ambigua* Beyr., a Mesoamerican, Caribbean, and North American species but definitely not from the type area (Cayenne, French Guiana); the other is *X. jupicai* L. C. Richard, a previously named species. This situation appears to be best handled by selecting the earliest available indisputably typified name. Material at Florence of the type collection of *X. macrocephala* (which I have seen only as photographs) appears likewise to be mixed. The main difficulty here is one of deciding the appropriate whereabouts of the lectotype and the varied interpretations of Vahl's original, and cryptic comments add much to the problem.

Xyris laxifolia, like *X. jupicai*, is a common weed of disturbed, mildly to very acid open areas and riverine forest borders. In North America it ranges from southeastern Virginia southward into northern Florida, thence west in the Coastal Plain into south-central Texas, with an outlier in Tabasco, Mexico. These northern populations are designated var. *iridifolia* (Chapm.), but even varietal distinction is difficult. In South America the species is general in wetlands, particularly at lower elevations from the Andean foothills to the Atlantic. Its most common associate xyrid is *X. jupicai* from which *X. laxifolia* differs primarily by having taller habit, broader and purple-based leaves, wider and smooth-edged scapes, larger and darker spikes with narrower bract apices. The seeds are mostly farinose. Much confusion in identification comes from larger specimens of the former and smaller specimens of the latter, also from the fact that the red pigments that so definitely mark *X. laxifolia* in the field do not persist for very many years on herbarium material or are entirely lost when specimens are treated with alcohol or formalin (as they so often are in the tropics).

3. Xyris jupicai Rich., Act. Soc. Hist. Nat. Paris I: 100. 1792. TYPE: French Guiana: "Cayenne," *LeBlond* (lectotype, P). Figure 3.

X. anceps Pers., Syn. Pl. I: 56. 1805, non Lamarck, 1791.
X. jupicae Michaux, Fl. Bor. Am. I: 23. 1803.
X. communis Kunth, Enum. Pl. 4: 12. 1843. TYPE: Brazil: without precise locality, "Amazonas, Pará, *Poeppig*" (isotype, L).
X. arenicola Miq., Linn. 18: 75. 1844.
X. gymnoptera Griseb., Cat. Pl. Cub. 223. 1866, in part (and in part *X. ambigua* Beyr.). TYPE: Cuba: without definite locality, 1865, *C. Wright 3228* (isotypes, NY, US).
X. acuminata Miq. ex. Steud., Syn. Pl. Glum. 2: 284. 1855.
X. jupicai var. *brachylepis* Malme, Sv. Bot. Tidskr. 21: 394. 1927.
X. macrocephala f. *minor* (C. Martius) M. Kuhlmann & Kuhn, Fl. Dist. Ibiti. 34. 1947.

Annual or short-lived, perennial, solitary or tufted, 1–10 dm high, the stems contracted, mostly dying by end of season, rarely perennating by bulbous overwintering lateral buds. Leaves mostly erect or ascending, 1–6 dm long; sheaths entire, often as long as the blades, tapering gradually from a dilated, pale green, dull brown or stramineous, keeled, ribbed base to the blade, there with edges convergent and merging with blade or with a short, erect triangular ligule; blades linear, strongly flattened, straight, the apex acuminate, erect or incurved, the margins thin or narrowly incrassate, smooth or papillate, the surface yellow-green with short streaks of maroon, finely nerved. Scape sheaths much shorter than leaves, the tubular bases multicostate and twisted, stramineous, pale green or pale brown, upwardly dilating and open, keeled, then narrowing to a slightly divergent, cusplike flat blade. Scapes straight, erect, rarely somewhat twisted, proximally terete, multistriate and 1–2-costate, tan or stramineous, distally slightly compressed and 1–2-costate, green, the costae narrow but strong, usually papillose-tuberculate, rarely smooth. Mature spikes ovoid, ellipsoid or oblong, 0.5–

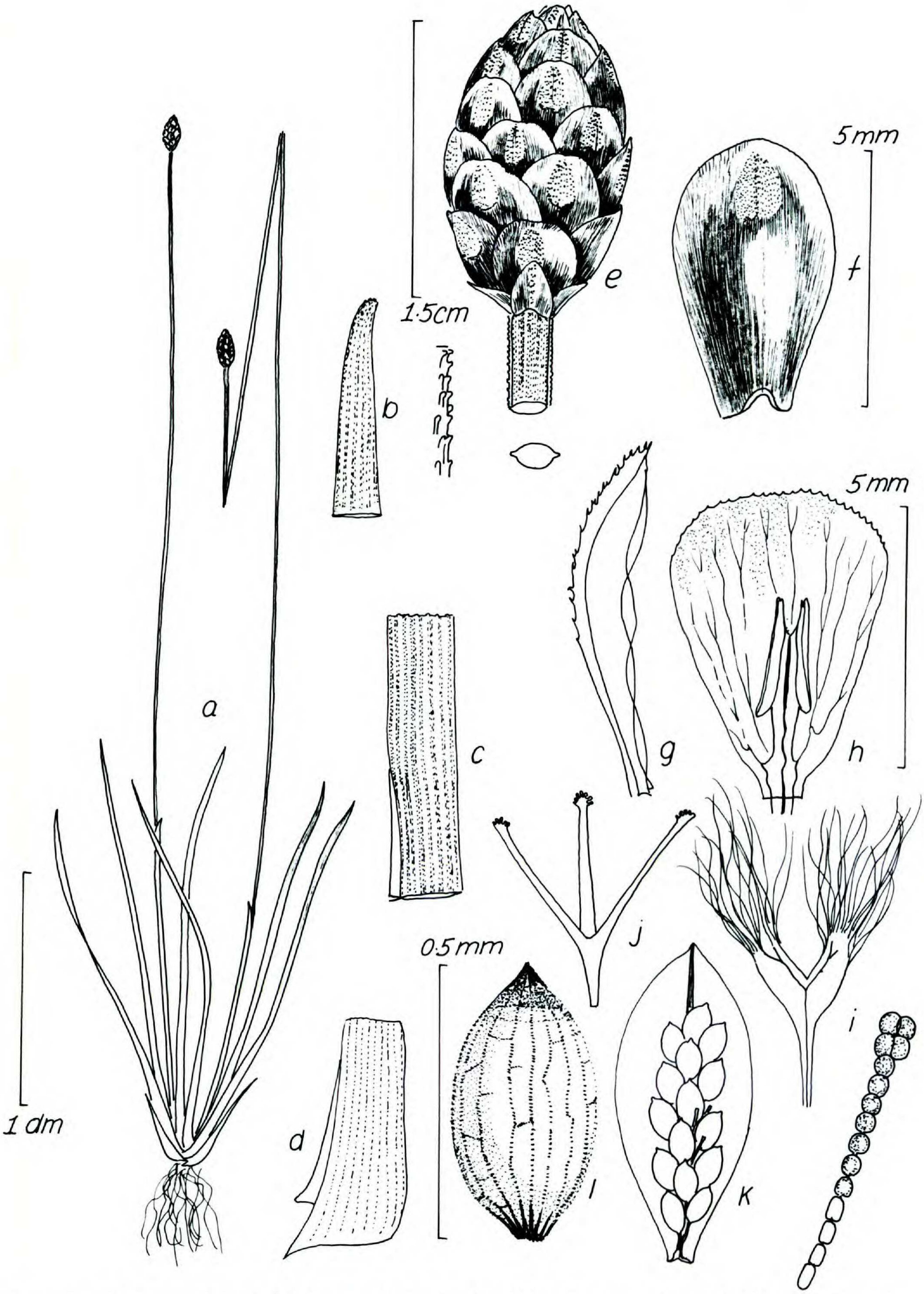


FIGURE 3. Xyris jupicai (Kral 25970). —*a. Habit sketch.—b. Leaf apex.—c. Leaf at blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged hair.—j. Stylar apex.—k. One valve of capsule.—l. Seed.*

1.5(–2.5) cm long, blunt or rarely acute, of many (several in depauperate individuals) rather loosely and spirally imbricate bracts, several of the lower ones sterile, narrower and shorter than the fertile bracts and grading into them; fertile bracts obovate to ovate, 5–7 mm long, apically rounded to broadly acute, the margin entire, aging erose, the backs strongly rounded, ecarinate, pale to dark red-brown, lustrous, the dorsal areas rectangular to elliptic, green, aging brown. Lateral sepals linear-oblanceolate, slightly curvate, from 3 mm long to equaling bracts, equilateral, very thin, usually pale green-tan, the thin but broad brownish keel lacerate from ca. middle to acute apex. Petal blades broadly obovate, ca. 3–4(–5) mm long, yellow, the broadly rounded to subtruncate apex denticulate-erose, the base cuneate. Staminodia bibrachiate with 2 broad flat branches terminally penicillate, most of the cells congested with dark material. Anthers lance-oblong, ca. 1.5 mm long, deeply bifid and auriculate on filaments ca. 1 mm long. Capsule thin, narrowly obovoid or ellipsoid, plano-convex, ca. 3–4 mm long, the placentae parietal, continuous to locule summit. Seeds broadly ellipsoid, ca. 0.4–0.5 mm long, pale amber, longitudinally with several papillate straight or anastomosing ribs and with several weaker cross-lines.

Distribution. Throughout the southeastern United States southward through the Caribbean and Central America, mostly at lower elevations, south into Argentina.

This morning-bloomer is a common wetlands weed over much of its range, generally in Central and South America, sharing its habitat with *X. laxifolia*, with which larger specimens are confused. Original material of "*X. macrocephala*" Vahl is largely *X. jupicai* (see discussion of species 2).

4. Xyris navicularis Griseb., Cat. Pl. Cub. 223. 1866. TYPE: Cuba: "savannas Dayanigua, *C. Wright 3229*" (presumed location of lectotype, HAC; isotypes, NY, US). Figure 4.

X. subnavicularis Malme, Ark. Bot. 13[8]: 15. 1913. TYPE: Belize: Stann Creek, Honduras, Rev. *J. Robertson* (holotype, BM).

Perennial or annual, usually cespitose, to 4.5 dm tall. Leaves flabellately spreading, (4–)10–15(–20) cm long; sheaths entire or, rarely, papillose or scabridulous-edged, the broad, clasping base maroon, brown or red-brown, often papillose, narrowing gradually into the blade, the ligule lacking or inconspicuous; blades linear-gladiate, flattened, sometimes slightly twisted, sometimes curvate, 2–5 mm wide, yellow-green or maroon-tinted, the apex incurved-acute, incrassate, the edges thin, entire or more often papillate or tuberculate-scabrid, the surface smooth or with short lines of papillae or tubercles proximally. Scape sheaths shorter than leaves, terete and multicostate, lustrous brown proximally, the blade often conspicuous, leaflike. Scapes linear, sometimes twisted, distally flattened, bicarinate, 0.8–1.2 mm broad, the costae often papillose-tuberculate. Spikes narrowly ovate to oblong (0.7–)1–2(–2.5) cm long, of several to many loosely spirally imbricated, pale brown or dark brown bracts; lowest sterile bracts distinctly smaller than the fertile bracts, narrower, mostly lanceolate, keeled, acute, grading gradually into the fertile bracts, these ovate to broadly oblong or suborbicular, ecarinate or imperceptibly so, ca. 4–5 mm long, broadly rounded, the rounded backs papillate, the edges thin, at first entire, the dorsal areas subapical, lanceolate to ovate, paler, often inconspicuous (particularly in age). Lateral sepals free, equilateral, elliptic, 3.5–4.5 mm long, strongly curvate, lustrous red-brown, the keel firm but narrow, ciliate or ciliolate from near base to acute apex. Petal blades broadly obovate, ca. 5 mm long, yellow, the rounded apex crenate-erose. Staminodia bibrachiate, the flat branches at tips long-penicillate. Anthers broadly oblong, ca. 1.5–2 mm long, deeply bifid and sagittate, on filaments ca. 1.5 mm long. Capsule obovoid, 4 mm long; placentation 3-parietal. Seeds ellipsoid or ovoid, 0.5–0.6 mm long, short-caudate, with 9–10 raised and smooth longitudinal ribs per side and sev-

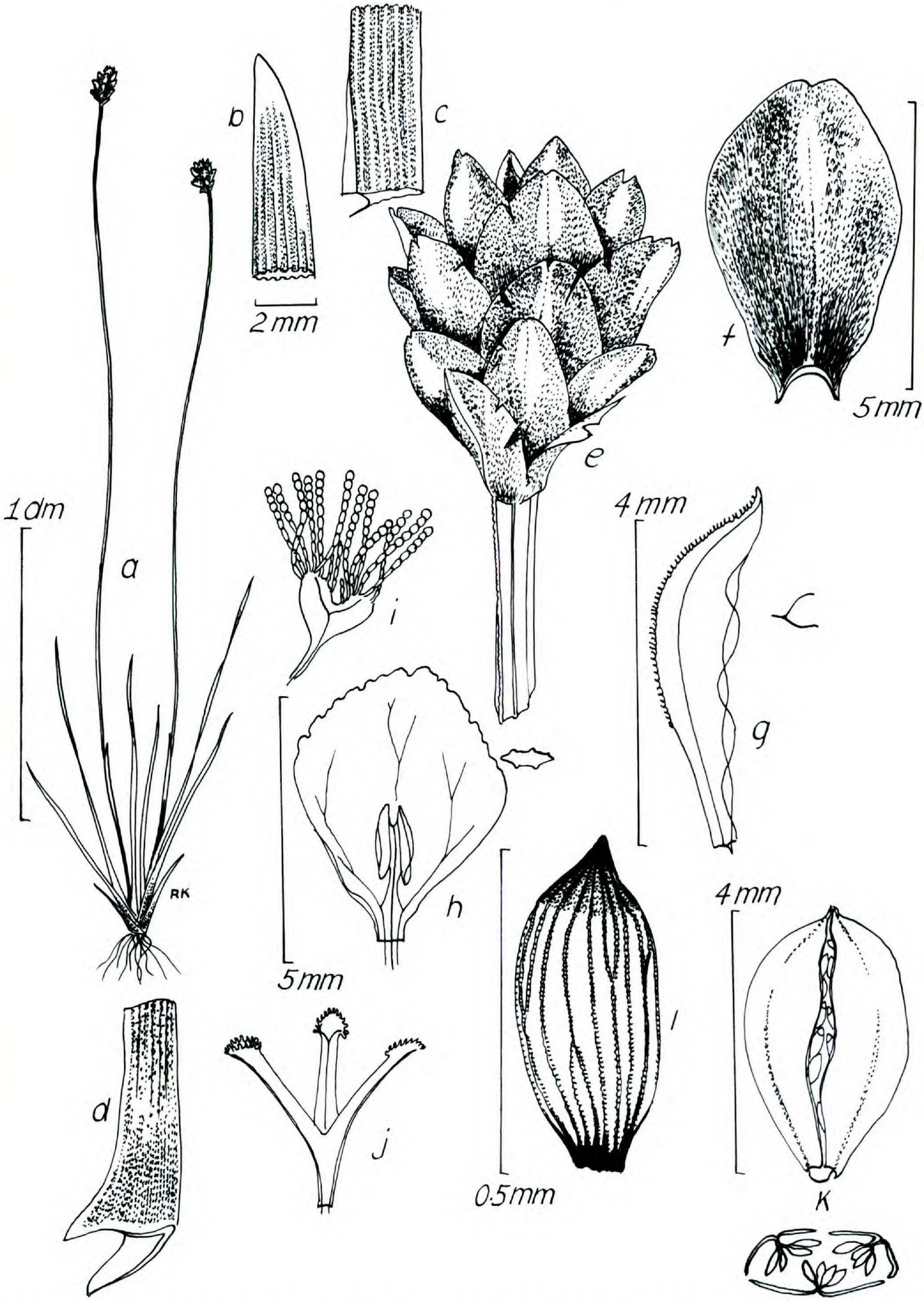


FIGURE 4. Xyris navicularis *(G. Proctor 38799)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule (outer face, showing line of dehiscence along dorsal bundle, this revealing tips of two placental lines of seeds).—l. Seed.*

eral indistinct crosslines, deep, lustrous, translucently amber.

Distribution. Low-altitude sandy palm or pine savanna from western Cuba through Belize and Honduras southward into Nicaragua (Zelaya); Colombia.

Xyris subnavicularis Malme, supposedly distinguished by having longer leaf sheaths associated with ciliate-scabrid blades and by its indistinct dorsal areas, falls in regard to these characters well within the total range of variation of *X. navicularis*. The species definitely centers in Cuba as to abundance.

5. Xyris anceps Lam., Illustr. I: 132. 1791. TYPE: "Guyane francaise," Herb. Hornemann (P, photo at F). Figure 5.

X. platycaulis Poiret, Encycl. 8: 820. 1808.
X. nitida Willd. ex Dietr., Sp. Pl. 2: 372. 1833.
X. pallida C. Martius, Fl. Bras. 24, Beibl. 2: 57. 1841. TYPE: Brazil. Bahia: "litoral, Camamu," 1818, *Martius s.n.* (type, M, photo at F).
X. fontanesiana Kunth, Enum. Pl. 4: 10. 1843.
?*X. bahiensis* Steudel, Syn. Pl. Glum. 2: 287. 1855.

Low to moderately robust, solitary or cespitose, glabrous, soft-based annual (1–)1.5–8 dm high. Leaves erect to spreading flabellately, the principal ones 5–40 cm long; sheaths up to ½ as long as blades, pale brown to stramineous or pink, soft, entire, multicostate, keeled just above base, the mid costa often papillose, the edges scarious, entire, gradually narrowing to the blade, there with a ligule up to 1 mm long; blades flattened, straight, ensiform-linear, pale or deep green, bluntly incurved-acute, the edges thin, or slightly incrassate and papillose-tuberculate. Scape sheaths shorter than principal leaves, loosely tubular, multicostate, proximally lustrous brown or pale brown, distally with short, erect blades. Scapes straight or flexuous, twisted, mostly bicostate distally, even ancipital, 1–3 mm wide, the costae entire or papillose. Spikes broadly ovoid, subglobose or hemispheric, 0.4–1.5 cm long, blunt, of several thin, scarious, pale to red-brown, lustrous, spirally imbricate bracts, these with short, subapical, gray-green, lanceolate dorsal areas, or the lowest bracts with elongate-lanceolate dorsal areas. Sterile bracts few, strongly keeled, about as long as the fertile bracts, these broadly obovate to suborbicular, 4–5.5 mm long, apically rounded, entire, the backs rounded, keeled strongly toward apex. Lateral sepals free, subequilateral, linear-oblanceolate, 4–5 mm long, acuminate or narrowly acute, the keel firm, smooth, slightly broadened distally. Petal blades obovate, ca. 3 mm long, coarsely dentate at broadly rounded apex. Staminodia broadly bibrachiate, the branches distally penicillate. Anthers oblong, ca. 1 mm long, deeply bifid and sagittate, on filaments ca. 0.5 mm long. Capsule oblong-obovoid or ellipsoid, ca. 3.5 mm long, umbilicate, the valves firm, lustrous brown, the placentation parietal from base to tip of fruit. Seeds broadly ovoid or ellipsoid, 3.5–4.5 mm long, translucent, pale to deep brown, biapiculate, strongly longitudinally ribbed, sparsely and finely cross-lined.

Distribution. Widespread and weedy in open, wet, acid areas and often littoral; Africa (including Madagascar); South America from the Guianas south to southern Brazil.

6. Xyris brachyfolia Kral & Wanderley, sp. nov. TYPE: Brazil. Amazonas: plateau of northern massif of Serra Araca, 0°51–57′N, 63°21–22′W, 1,200 m; southern extremity of northern plateau of Serra Araca, shrub forest. Growing on floor of moist shrubby forest, 15 Feb. 1984, *G. T. Prance, I. L. do Amaral, J. J. Pipoly, A. S. Tavares, M. G. da Silva, C. D. A. da Mota & A. Cress 29079* (holotype, INPA; isotypes, NY, VDB). Figure 6.

Planta perennis, caespitosa, glabra, 4–5 dm alta. Caules breves. Radices graciles. Folia principalia curta, suberecta, brunneola, nitida, vaginis scaporum breviora, persaepe stricte vagina, vel usque ad 5 cm longa, vulgo vagina; vaginae albovillosiciliatae, ad basin gradatim dilatatae, in laminas gradatim decrescentes, eligulatae; laminae leviter compressae, excurvatae, acutae, integrae. Vaginae scaporum elongatae, usque ad 1 dm longae, multicostatae, tortae, nitidae. Scapi graciles, erecti, torti, apicem versus teretes, multistriati vel valde costati, 0.7–0.9 mm crassi. Spicae pauciflorae, ellipsoideae, tum anguste obovoideae,

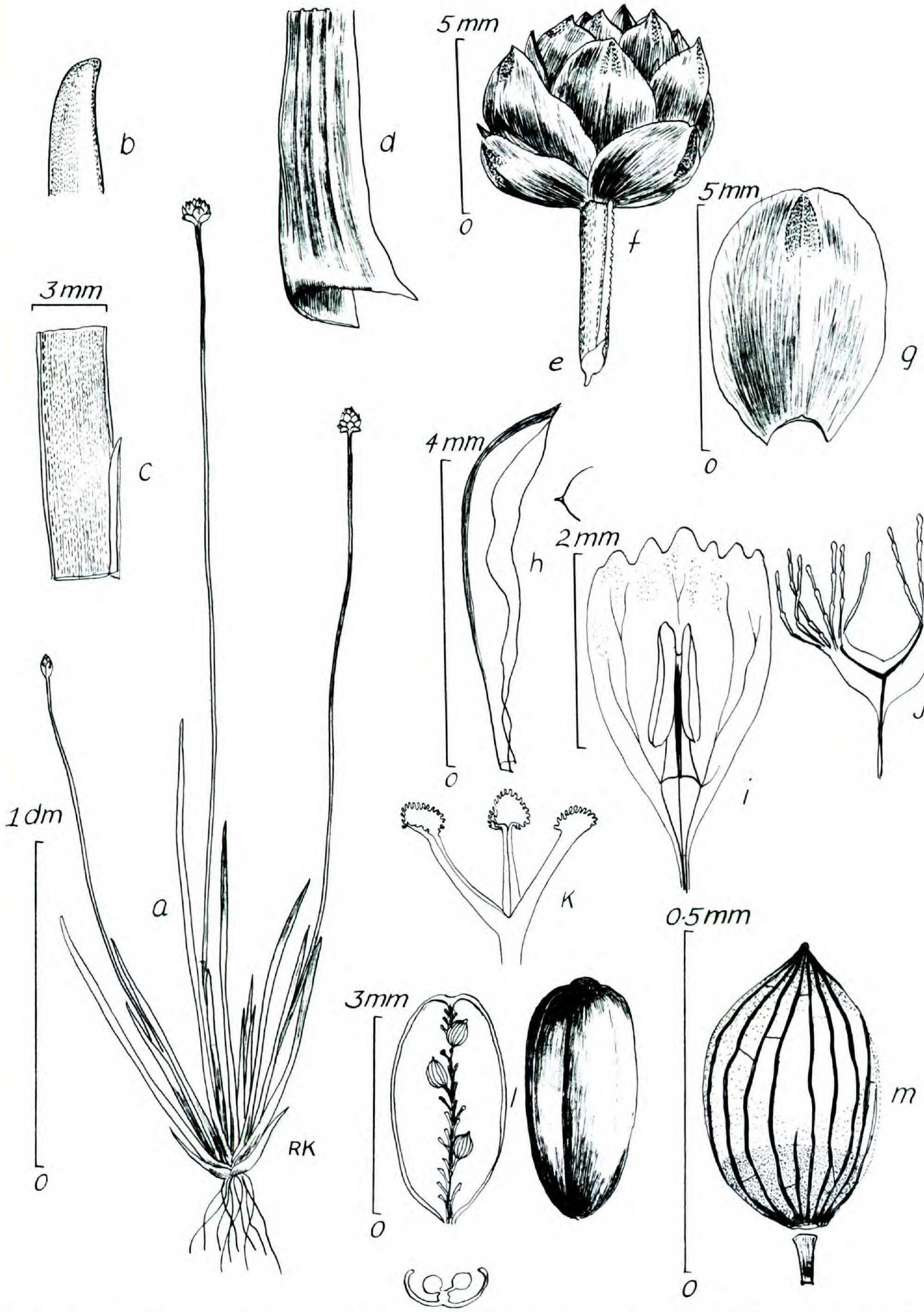


FIGURE 5. Xyris anceps *(*Austin et al. 6950*)*.—*a. Habit sketch.—b. Leaf tip.—C. Leaf blade–sheath sector.—d. Leaf base.—e. Upper scape.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode.—k. Stylar apex.—l. Two views of capsule, at left one valve, at right intact capsule.—m. Seed.*

5–7 mm longae. Bracteae laxae spiraliter imbricatae, area dorsali conspicue; bracteae steriles 5–6, infimis late ovatis vel suborbiculatis, 1–2 mm longis, margine scariosis et dorsaliter albovillosis, superioribus ovatis, 3.5–4.5 mm longis, rotundatis, integris; bracteae fertiles ovatae, 4.5–5 mm longae, rotundatae, integrae, matrice brunneola, nitida, area dorsali ovata, viridula, mediana vadosi costali. Sepala lateralia libera, subaequilateralia, lanceolata, ca.

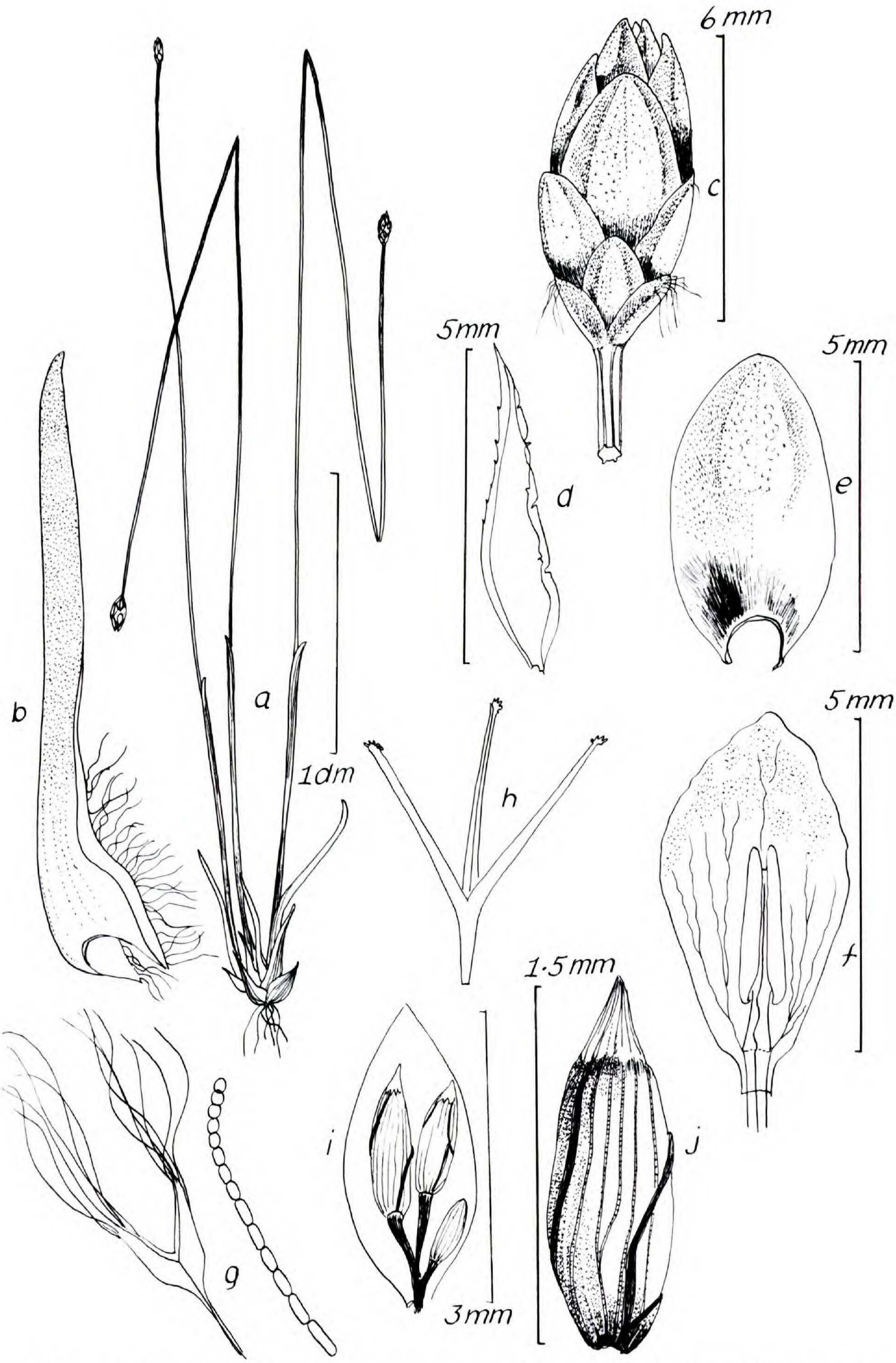


FIGURE 6. Xyris brachyfolia *(*Prance et al. 29079*)*.—*a. Habit sketch.—b. Principal leaf.—c. Spike.—d. Lateral sepal.—e. Fertile bract.—f. Petal blade, stamen.—g. Staminode and beard hair.—h. Stylar apex.—i. Valve of capsule with attached placenta, seeds.—j. Seed.*

5 mm longa, acuta, delicatula, leviter curvata, ala carinali distaliter distante scabrolacera vel scabrida. Lamina petalorum obovata, luteola, ca. 5 mm longa, anguste rotundata, integra. Staminodia bibrachiata, brachiis longipenicillatis. Antherae lanceolatae, 1–1.2 mm longae; filiis ca. 1 mm longis. Capsula ca. 3 mm longa, ovoidea, placenta basalis-parietalis. Semina fusiformes, ca. 1.5 mm longa, translucentia, atroferruginea, valde longitudine costalis.

Cespitose perennial, smooth, 4–5 dm high. Stems short. Roots slender and fibrous. Principal leaves short, suberect, brownish, lustrous, shorter than the scape sheath, often strictly sheath, up to 5 cm long, then mostly sheath; sheaths white-villous-ciliate, gradually broadening to base, gradually narrowing to apex, eligulate; blades lightly flattened, excurvate, acute, entire. Scape sheaths elongate, to 1 cm long, multicostate, twisted, shining, short-bladed or cuspidate. Scapes slender, erect, twisted, terete toward apex, multistriate to shallowly costate, 0.7–0.9 mm thick. Spikes few-flowered, ellipsoid, becoming narrowly obovoid, 5–7 mm long. Bracts spirally and loosely imbricate, the dorsal area conspicuous; sterile bracts 5–6, the lowest broadly ovate to suborbicular, 1–2 mm long, marginally scarious and dorsally white-villose, the uppermost ovate, 3.5–4.5 mm long, rounded, entire; fertile bracts ovate, 4.5–5 mm long, rounded, entire, the matrix brown, lustrous, the dorsal area ovate, green, medially shallowly costate. Lateral sepals free, subequilateral, lanceolate, ca. 5 mm long, acute, delicate, slightly curvate, the keel distally distantly scabrolacerate or scabrid. Petal blades obovate, yellow, ca. 5 mm long, narrowly rounded, entire. Staminodes bibrachiate, the branches long-penicillate. Anthers lanceolate, 1–1.2 mm long, on filaments ca. 1 mm long. Capsule ca. 3 mm long, ovoid, the placentae basal-parietal. Seeds fusiform, ca. 1.5 mm long, translucent, deep red-brown, strongly ribbed longitudinally.

This species is morphologically closest to extremes of *X. fallax* Malme and is particularly noteworthy because of its transitional placentation type: basal-parietal. This is a further indication of the weakness of sections in *Xyris* based primarily on placentation. The long and strongly ribbed seeds with strong, irregularly raised outer seed coat are hardly distinguishable from those of *X. fallax*; pigmentation of leaves and scapes is likewise within the range of that species. However, the distinctly pale-villous patches on the spike bracts are notable and distinct. The sheath borders are consistently long-ciliate.

7. **Xyris neblinae** Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 26, fig. 11A–E. 1963. TYPE: Venezuela. T. F. Amazonas: summit savanna near west escarpment 2 km north of Cumbre Camp, occasional, 1,800 m, Cerro de La Neblina, Río Yatúa, 12 Jan. 1954, *B. Maguire, J. J. Wurdack & G. S. Bunting 37243* (holotype, NY; isotypes, US, VEN). Figure 7.

Tall, rushlike, cespitose, brittle perennial to 1 m tall, the stems contracted. Leaves erect, to 7 dm long; sheaths less than ½ as long as blades, firm, eciliate, dull-castaneous, nearly black, narrowing gradually from an abruptly dilated, deepset base to blade, at blade level with an erect, truncated ligule broader than leaf blade base; blades narrowly linear, terete except at the often narrow and dorsiventrally flattened base, ca. 1–1.5 mm thick, multiribbed; conic-subulate apically, the surface smooth except toward papillate base. Scape sheaths shorter than principal leaves, fluted, apically short-bladed. Scapes flexuous, twisted, terete distally, ca. 1 mm thick, ecostate, striate, sometimes papillate. Spikes ellipsoid to lance-ovoid, 1–2 cm long, acute and attenuate, reddish brown, of many, loosely and spirally imbricated papillose bracts with distinct, paler, red-brown to green dorsal areas, these with a low midnerve; sterile bracts several, oblong or narrowly ovate, slightly to much shorter than the fertile bracts, the lowest smallest and keeled, grading gradually into the fertile bracts, these ca. 8 mm long, broadly oblong, ciliolate, the backs convex and ecarinate, the apex broadly to narrowly rounded. Lateral sepals free, subequilateral, lineal, ca. 8–10 mm long, sometimes exsert-

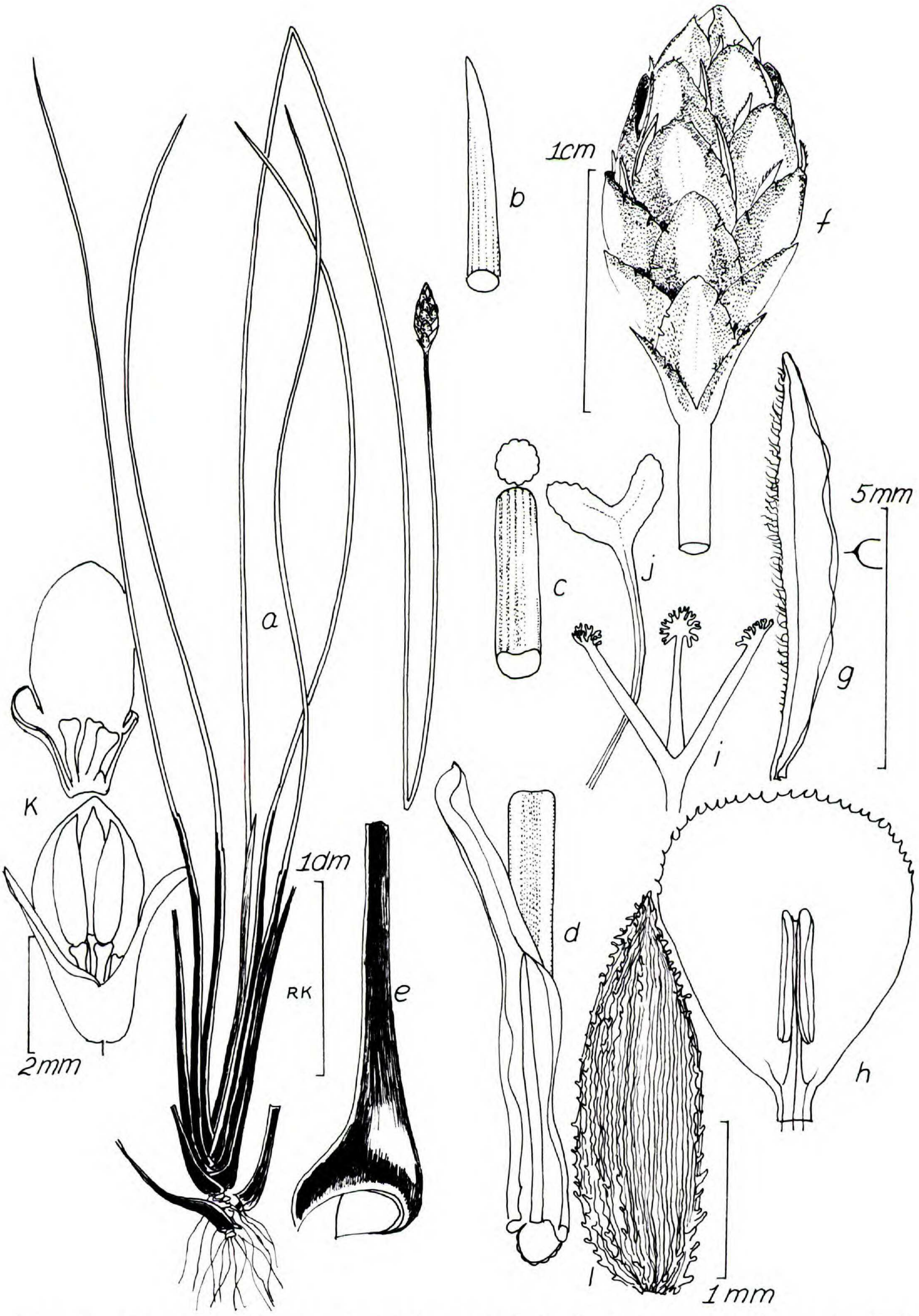


FIGURE 7. Xyris neblinae (Maguire et al. 37243).—*a. Habit sketch.—b. Leaf apex.—c. Sector of leaf blade a few cm above sheath apex.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h.*

ed, the narrow, red-brown keel red-ciliolate or villosulous-ciliate from near base to the acute but blunt apex. Petal blades broadly obovate, 7–8 mm long, yellow, the broadly rounded apex lacerodentate. Staminodia bibrachiate, the short, broad, flat branches without hairs. Anthers lance-oblong, 2–2.5 mm long, emarginate, shallowly auriculate, on filaments ca. 1 mm long. Capsules obovoid, 4–4.5 mm long, the placentation basal, the funiculi stubby, the valves firm, dehiscing only ⅔ down, lacking septa. Seeds few, mostly 3–4 per capsule, cylindric, 2.5–3 mm long including a pale apiculus 0.5 mm long, the surfaces deep amber, longitudinally finely ribbed, the ribs (particularly toward base and tip of seed) muriculate, papillate or tuberculate.

Distribution. Known only from the type area, in wet rocky savanna.

This rare species, so far known only from Cerro de La Neblina, most resembles the brittle, rushlike *X. juncifolia* Maguire & Smith of Cerro Guaiquinima of neighboring Estado Bolívar in Venezuela. However, that species has leaf bases brown (rather than castaneous or near black), strongly inequilateral (versus equilateral) sepals, bearded (versus beardless) staminodia, and shorter and smoother seeds. Nonetheless, the superficial resemblance is striking.

8. Xyris juncifolia Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 26, fig. 10A–E. 1963. TYPE: Venezuela. Bolívar: common in Cumbre Camp, 2,000 m, Cerro Guaiquinima, Río Paragua, 25 Dec. 1951, *B. Maguire 32750* (holotype, NY; isotype, US). Figure 8.

Slender, rushlike, cespitose, brittle perennial to 1 m high, the stems contracted or short-ascending and short. Leaves erect or ascending, 4–6 dm long; sheaths dull brown or red-brown, less than ½ as long as blades, eciliate, narrowing gradually from a slightly dilated base to leaf blade, there producing an erect, firm, broad, rounded ligule to ca. 2 mm long; blades terete, fluted, narrowly lineal, to 1.5 mm thick, toward base above ligule usually deeply sulcate, toward apex narrowing to a blunt, callused tip. Scape sheaths much shorter than leaves, tubular and multiribbed proximally, opening distally, slightly dilated, with a cusplike, blunt-tipped blade. Scapes slightly flexuous and twisted, about the width of leaf blades or slightly wider, wandlike, distally terete, sometimes shallowly grooved. Spikes ellipsoid to obovoid, 1.5–2 cm long, reddish brown, acute, basally attenuate, of many tightly spirally imbricate, ciliolate bracts with distinct, deeper brown dorsal areas, the sterile bracts numerous, broadly ovate, broadly rounded, much smaller than and grading into the fertile bracts; these obovate, ca. 6 mm long, rounded-folded, ecarinate but with a pale, low midrib, the apex broadly rounded, aging lacerate. Lateral sepals free, strongly inequilateral, oblong-curvate, ca. 5 mm long, acute or blunt, the dark red-brown, firm keel ciliolate, toward apex reddish fimbriolate. Petal blades broadly elliptic or broadly obovate, ca. 5 mm long, the broadly rounded apex lacerate. Staminodia bibrachiate, the narrow flat branches distally long-penicillate. Anthers ca. 1.5 mm long, oblong, deeply bifid and sagittate, on filaments ca. 1.5 mm long. Capsule broadly obovoid, slightly compressed, ca. 3 mm long, the placentation basal, the valves producing low septa. Seeds few, ellipsoid-cylindrical, ca. 1.5 mm long, apiculate, deep amber, longitudinally rather coarsely 20–24-ribbed.

Distribution. Locally frequent, summits of tepuis Guaiquinima and Jaua, Bolívar, and tepuis Duida and Paru, Amazonas, Venezuela.

←
Petal blade, stamen.—i. Stylar apex.—j. Staminode.—k. Capsule; below with seeds on funicles, valves separating naturally, above with two valves removed, showing seedless funicles.—l. Seed showing ribbing and muriculation (seeds much darker than shown).

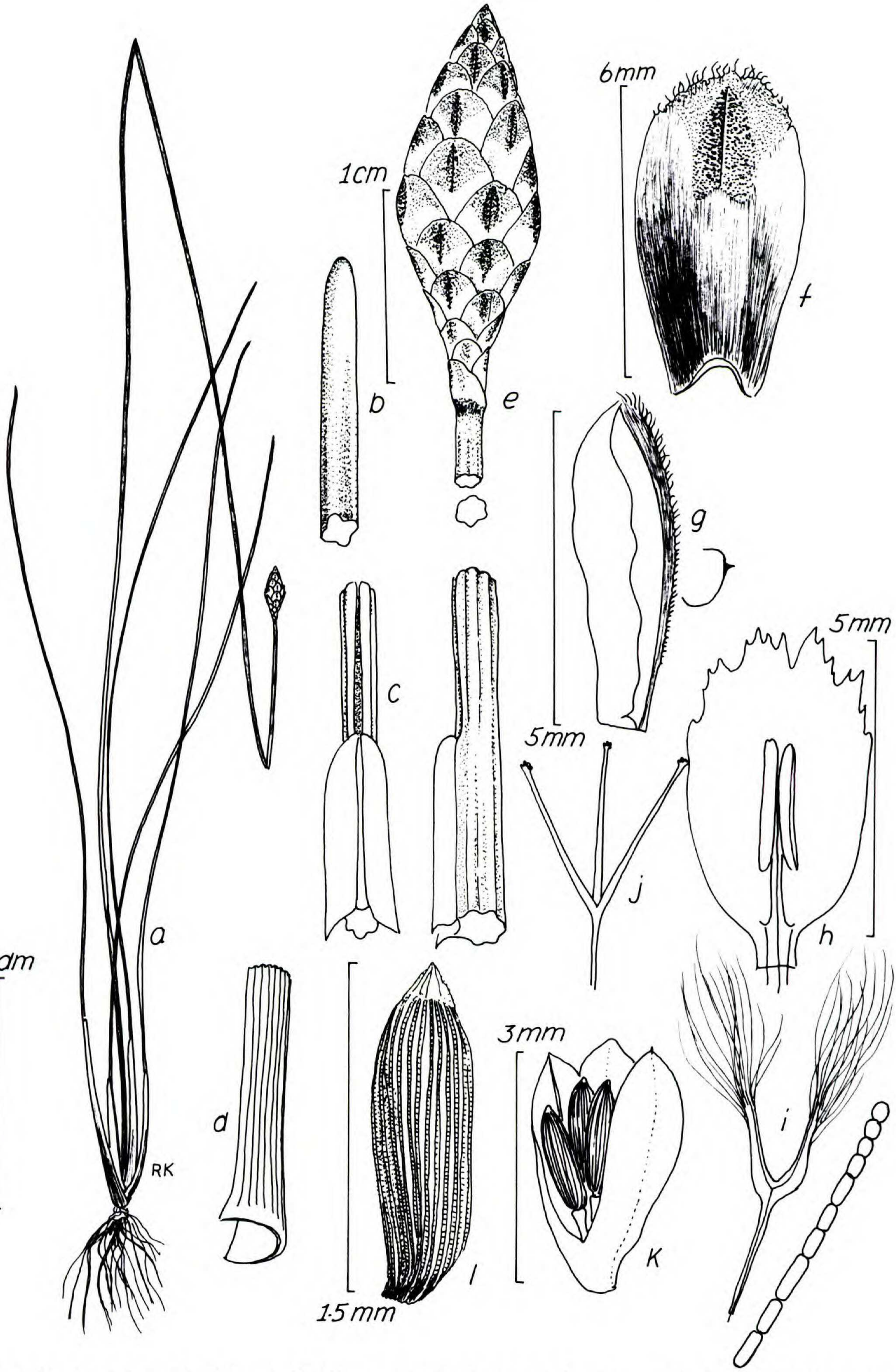


FIGURE 8. Xyris juncifolia (Maguire 32750).—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction, inner view, side view.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—*

This species, with its fusiform-ellipsoid spikes; terete, rushlike, brittle foliage; and distinct dorsal areas, most resembles *X. neblinae* of Cerro Neblina but differs in its inequilateral (rather than equilateral) lateral sepals and brownish (rather than castaneous) base. These two species and the Colombian *X. terrestris* form a complex of brittle-foliaged, rushlike xyrids closest to *X. atriceps* Malme subsp. *neblinensis*. Known until 1951 only from the type locality, *X. juncifolia* has now been collected from Cerro Jaua (*Steyermark et al. 109427*, NY, VEN), from Cerro Duida (*Steyermark 124560*, NY, VEN), and from Paru (*Cowan & Wurdack 31185*, GH, NY, US), as well as several times more from the type region.

9. Xyris lanulobractea Steyerm., Fieldiana, Bot. 28(1): 109, fig. 16D–H. 1951. TYPE: Venezuela. Bolívar: swampy ground, 1,200 m, Kavanayen, Gran Sabana, 26 Oct. 1944, *J. A. Steyermark 59336* (holotype, F; isotypes, US, VEN). Figure 9.

Slender, rushlike, cespitose, hard-based, glabrous perennial 4–7 dm high, the stems contracted. Leaves erect, 2–4 dm long; sheaths entire, elongate but less than ¼ of blade length, deep glossy red-brown, the backs ecarinate, the sides tapering gradually into blade, there with an erect ligule to 3 mm long; blades terete or oval in cross section, 0.5–0.7 mm thick, fluted, slightly flattened and deeply sulcate at base above ligule, apex tapering-subulate-conic or with very tip dilated clavately. Scape sheaths much shorter than leaves, tubular at base, multicostate, twisted, open at apex, keeled, stubby-bladed. Scapes slightly twisted, straight or flexuous, terete distally, ca. 1 mm thick. Spikes broadly ovoid to obovoid, 0.7–1(–1.5) cm long, blunt, dull brown, attenuate, the many spirally imbricate bracts with conspicuous dorsal areas; sterile bracts several, ovate, narrowly to broadly rounded, ecarinate, the lowest evidently much smaller than the fertile bracts, grading into them; fertile bracts broadly elliptic to obovate, ca. 6 mm long, with broadly rounded, white-villosulous borders, convex and ecarinate backs, and reddish brown, obovate or broadly elliptic dorsal areas. Lateral sepals strongly curvate, elliptic, ca. 4 mm long, thin, the broad firm keel ciliolate below middle, increasingly pale-villous-fimbriate above middle. Petal blades broadly obovate to suborbicular, yellow, ca. 5 mm long, the rounded apex serrulate-dentate. Staminodia bibrachiate, the slender recurved branches densely penicillate-pilose. Anthers oblong, 1 mm long, bifid and sagittate, on filaments ca. 1 mm long. Capsule obovoid, ca. 2 mm long, placentation basal, the valves without septa. Seeds few on short, stubby funicles, cylindrical or lance-ovoid, amber, 1.1–1.3 mm long, often angulate, finely ribbed longitudinally.

Distribution. Low to medium-elevation savanna, southeast Venezuela (Bolívar), Guayana, and contiguous northern Brazil (Amazonas).

Additional specimens examined. BRAZIL. AMAZONAS: rd. to Igarapé Preto ca. 60 km SE of Transamazon Hwy., 2 July 1979, *Calderon et al. 2743*; Mun. Humaitá, estrada da Humaitá–Jacarecanga, km 62, 17 June 1982, *Teixeira et al. 104.938* (INPA, NY, US, VDB). GUAYANA. UPPER MAZARUNI DIST.: Makwaima savanna near Mayoripai, at Kako River, 8 Feb. 1985, *J. Renz 14145* (U). VENEZUELA. BOLÍVAR: meseta norte de Serranía Cararuban, 19 Feb. 1964, *G. Agostini 403* (NY, U, VEN); Auyantepui, Sept. 1937, *F. Cardona 262* (US, VEN); ca. 17 km al NE de Ikabarú, *Huber et al. 6732* (MYF, VDB, VEN); hacia Icabarú, 27 July 1983, *Huber & Alarcon 7891* (MYF, NY, VEN); 20 km NE de Uriman, *Huber 8474* (MYF, VDB); ca. 20 km NE Ikabarú, *Huber et al. 9650* (MYF, VDB, VEN); Valle de Río Karuay inferior, 18 Nov. 1984, *Huber et al. 9795* (MYF, VDB, VEN); ca. 35 km al W de Caserio de Chiguao, 23 Mar. 1985, *Huber 10355* (MYF, VDB, VEN); 46 km N of Sta. Elena, 28 July 1983, *Kral 70562*; Río Yuruani just above falls, 17 Dec. 1984, *Kral 72163*; N of Río Yuruani Ferry, *Kral 72194* (*Kral* numbers to be distributed, presently MYF, VDB); between Urarupata and Enemasic, 6 Feb. 1952, *Maguire 33234* (GH, US, VEN); 13 km NE

←

i. Staminode.—j. Stylar apex.—k. Dehiscing capsule (note that dehiscence in this species is not to capsule base).—l. Seed.

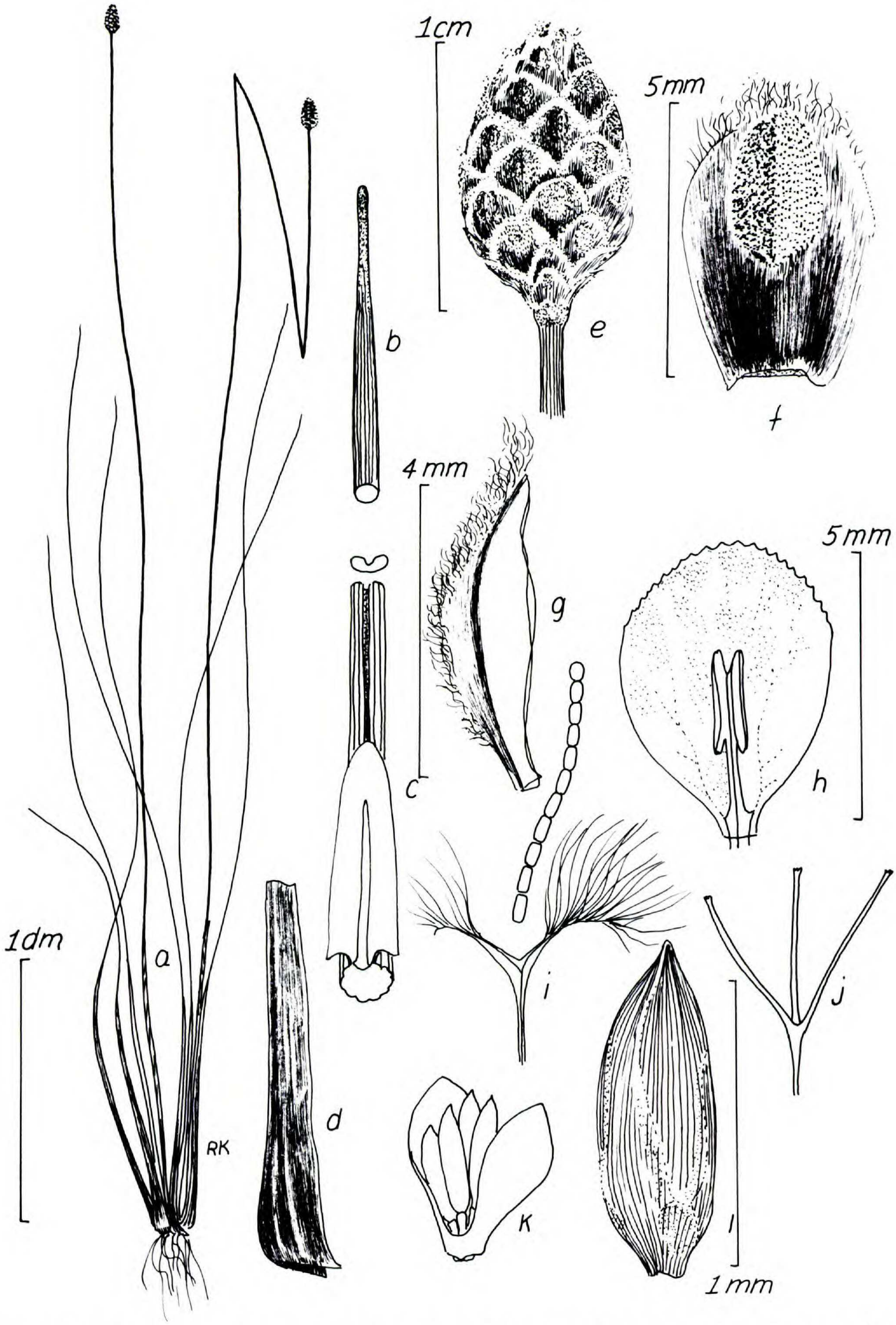


FIGURE 9. Xyris lanulobractea *(*Maguire 33234, Kral 70562*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf at sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule, one valve removed, showing placentation.—l. Seed.*

Sta. Elena, 2 Dec. 1982, *Steyermark & Liesner 127486* (VDB, VEN).

This slender morning bloomer is most similar superficially to *X. globosa* Nilsson, differing in its somewhat more slender habit, more tapering (rather than bulbous) base, more consistently terete leaf blades, ligulate sheath apex, plumose (rather than beardless) staminodes, and broader petal blades. Brazilian collections of *X. globosa* may well turn out to be *X. lanulobractea*.

10. Xyris terrestris Idrobo & Lyman B. Smith, Caldasia 6(29): 208, fig. 10. 1954. TYPE: Colombia. Vaupés: "Cerro de Caenda" (sabanas), 380–670 m, Río Kubiyu, 4 Nov. 1952, *H. García-Barriga 15090* (holotype, COL; isotypes, GH, NY, US). Figure 10.

Solitary or small-clumped, slender, smooth perennial 3–5 dm high, the stems short, erect from a short, stout, horizontal or ascending rhizome. Leaves mostly erect or ascending, twisted, 1–2.5 dm long; sheaths much less than ½ as long as blades, entire, proximally rich, lustrous red-brown or castaneous, strongly dilated at very base, thence upward gradually narrowing into an erect, narrowly triangular, chaffy ligule 3–6 mm long; blades filiform-linear, flexuous, terete or elliptic or rounded-angulate in cross section, 0.5–0.6 mm thick, yellow-green, blunt-conic at apex, longitudinally with a single, spiral, shallow to deep, papillate, usually rusty-colored sulcus. Scape sheaths shorter than leaves, with shorter blades similar to those of leaves. Scapes linear, twisted and flexuous, distally terete, ca. 0.5–0.6 mm thick, ecostate but multistriate. Spikes ellipsoid, or lance-ovoid, 0.7–2 cm long, subacute, attenuate-based, of numerous, spirally imbricate, stiff, brownish bracts, the sterile bracts numerous, the lowest lance-triangular, keeled, much smaller than, and grading into, the fertile bracts, these mostly broadly obovate, broadly to narrowly rounded apically, 4–5 mm long, the margins entire to erose in age, the back rounded, ecarinate, with strong but small, red-brown to yellow-brown, elliptic dorsal areas. Lateral sepals strongly curvate, oblong, ca. 4 mm long, free, very inequilateral, the broad, deep, reddish brown keel scabrociliate from near base to blunt apex. Petal blades obovate, ca. 4 mm long, yellow, the broadly rounded apex erose-denticulate. Staminodia bibrachiate, the flattened branches long-penicillate. Anthers oblong, ca. 2 mm long, shallowly bifid and auriculate, on filaments ca. 0.5 mm long. Capsule narrowly obovoid-apiculate, brown, 2–2.5 mm long, dehiscing only ⅔ way to base, the placenta massive and basal, the funiculi short, broadly clavate. Seeds several, cylindric-fusiform, 1.3–1.5 mm long, red-amber, irregularly anastomosing-ribbed longitudinally.

Distribution. Sandy savannas, Vaupés, southeastern Colombia, rare.

Additional specimens examined. COLOMBIA. VAUPÉS: Mesa de Yambi savanna, 15–16 Apr. 1953, *Schultes & Cabrera 14235A* (COL, GH, NY, U, US); Araracuara savannas, Río Caquéta, 6 Sept. 1959, *Maguire & Fernandez 44163* (NY).

There are so many species shared by border states in Colombia and Venezuela that it is reasonable to expect this plant to be found in T. F. Amazonas in Venezuela, where there is much savanna suitable for it.

11. Xyris scabridula Steyerm., Fieldiana, Bot. 28(1): 111. 1951. TYPE: Venezuela. T. F. Amazonas: around rills on rocky dry ridgetop, Brocchinia Hills, 1,700–1,900 m, Cerro Duida, 1 Sep. 1944, *Steyermark 58168* (holotype, F; isotypes, NY, VEN). Figure 11.

Slender, cespitose perennial 1.8–4 dm high, the stout stems mostly contracted. Leaves shorter than scape sheaths, strongly flexuous and twisted, mostly erect; sheaths eciliate, ¼ or less of blade length, firm, at very base deep red-brown or castaneous, strongly ribbed, lustrous, becoming roseate or purple above, scabridulous, narrowing gradually to blade; blades variously elongate, strongly rib-angled in cross section, also deeply sulcate, narrowly linear, ca. 1 mm thick, reddish or purplish and pale-

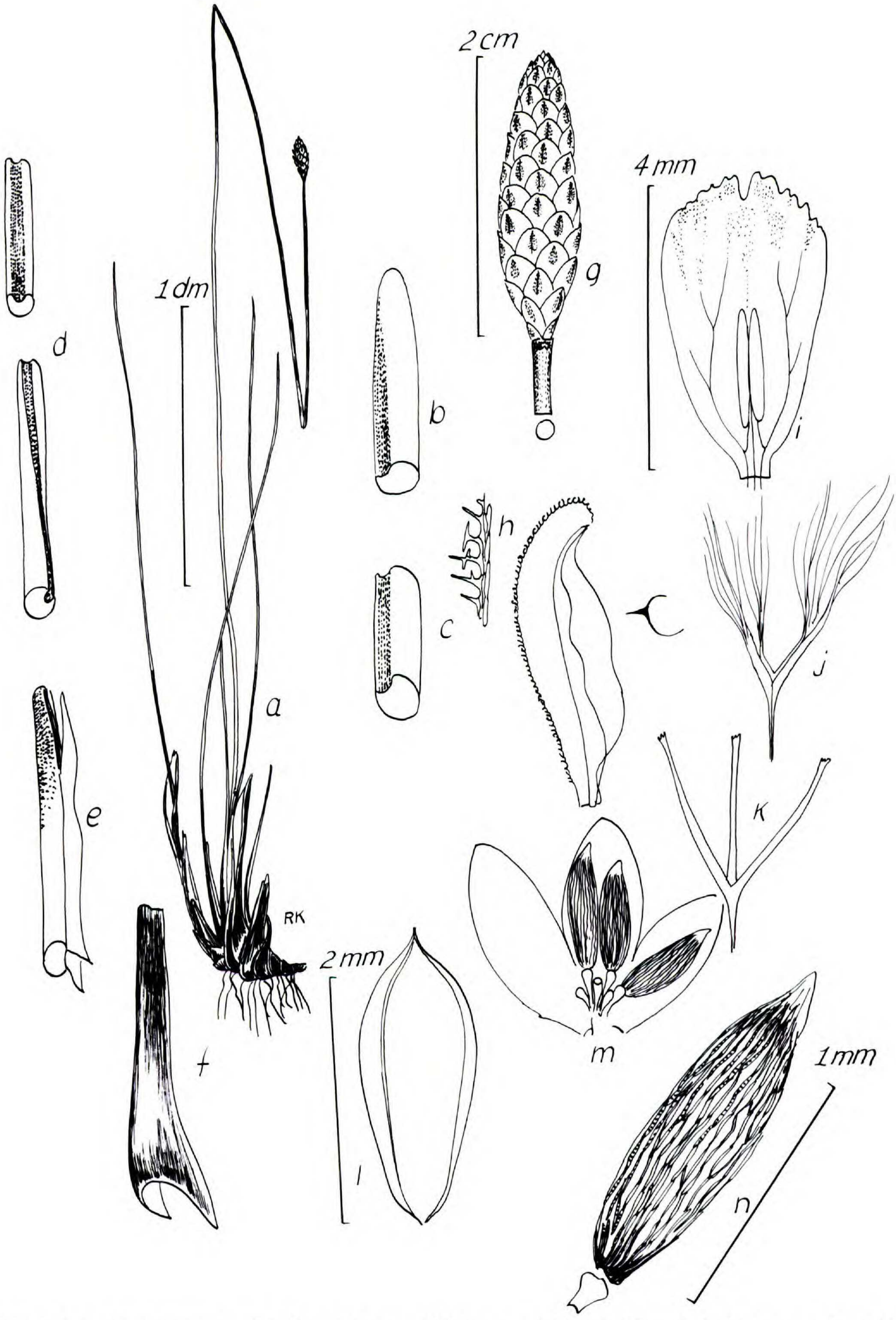


FIGURE 10. Xyris terrestris *(*Schultes & Cabrera 19179*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade a few cm below apex.—d. Further down leaf blade than c (and more reduced).—e. Leaf sheath–blade junction.—f. Leaf base.—g. Spike.—h. Lateral sepal and greatly enlarged sector of keel hairs.—i. Petal blade, stamen.—j. Staminode.—k. Stylar apex.—l. Outline of capsule.—m. Dehisced capsule showing basal placentation.—n. Seed.*

scabridulous toward base, smooth, green toward tip, narrowed abruptly to a blunt, callused apex. Scape sheath much shorter than blade, mostly tubular, twisted, strongly multicostate, reddish brown or pink at base, distally with a short, blunt cusp. Scapes twisted and flexuous, subterete toward apex, ca. 0.8 mm thick, with 1–3(–4) strong, smooth costae and some less distinct ribs, or nearly ecostate, proximally strongly multicostate. Spikes ovoid, 7–8 mm long, of several erect, spirally imbricate, ecarinate, brown, definitely papillate bracts without dorsal areas, the sterile bracts several, the lowest much smaller than the fertile bracts, orbicular or reniform, gradually grading into fertile bracts, these 4–5 mm long, broadly obovoid, broadly rounded apically, appearing entire but minutely papillate-ciliate. Lateral sepals free, equilateral, elliptic and strongly curvate, ca. 4 mm long, obtuse, the keel rusty-ciliolate.

Distribution. Cerro Duida, Territorio Federal Amazonas, and Chimantá Massif, Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: savanna summit of Macizo Chimantá, *Huber & Colella 9001* (NY, VDB, VEN); *Huber & Steyermark 7162* (NY, VDB, VEN); *Huber et al. 9070* (NY, VDB, VEN); *Huber 9576* (NY, VDB, VEN); *Steyermark & Wurdack 1010* (F); *Steyermark et al. 115922* (F); *Steyermark 128429* (VDB, VEN).

This taxon has some affinity to *X. subglabrata* Malme of lower elevations in T. F. Amazonas, Venezuela, but has smoother spikes with no evident dorsal area. It also resembles *X. stenophylloides* Malme, an equally rare plant from the same area, whose leaf blades, though very narrow, are flattened. None of these species are much collected, so that comparisons of flowers and seeds are not yet made.

12. Xyris atriceps Malme, Bull. Torrey Bot. Club 58: 325. 1931. TYPE: Venezuela. T. F. Amazonas: forming tussocks, 6,700 ft., Cerro Duida, Ridge 15, Aug. 1928–Apr. 1929, *G. H. H. Tate 688* (lectotype, NY; isolectotype, US).

Densely tufted, slender, low to tall perennials 2–6 dm high, the stems short to elongate, up to 5 cm long. Leaves elongate, linear to filiform, erect or ascending, 1.5–3 dm long; sheaths deep reddish brown to nearly black, lustrous, smooth to papillose-rugulose apically, less than ½ as long as blades, entire, tapering evenly from broad, ecarinate base to distinct, firm or thin, erect, broad ligule 2–10 mm long, there broader than the usually terete blade; blades deep green, linear to filiform, 0.5–1 mm thick, sometimes fluted, usually with a median ventral sulcus, the apex blunt, broadly rounded or truncate, rarely conic, smooth, the surfaces smooth except toward the often rugulose-papillose base. Scape sheath shorter than leaves, loose, often purplish, rarely pink, the blade short, erect, blunt. Scapes flexuous or straight, twisted, terete, 0.5–1 mm thick, smooth or white-puncticulate from sunken stomata. Spike ovoid to oblong or obovate-turbinate, 0.5–1.5 cm long, the base attenuate, of several pale to deep brown or castaneous, spirally loosely imbricate bracts without distinct dorsal areas. Sterile bracts up to 6, erect or squarrose-tipped, triangular to obovate, entire to lacerate or ciliolate-villosulous-bordered, smaller than and grading into the fertile bracts, these oblong to obovate, 3.5–8 mm long, entire to villosulous-ciliate, ciliolate or pectinate-lacerate, the backs broadly rounded, smooth to papillose. Lateral sepals free, subequilateral, straight or curvate, linear or oblong-linear, 3.5–7 mm long, acute, sides pale brown, keels deep reddish brown, ciliolate to densely villous-ciliate. Petal blades broadly obovate to suborbicular, 6–7 mm long, the broadly rounded apex coarsely erose. Staminodia bibrachiate, the branches long-penicillate, or staminodia absent (subsp. *marahuacae*). Anthers oblong to lance-oblong, 2–2.5 mm long, shallowly bifid apically, deeply sagittate at base, on filaments ca. 1 mm long. Capsule cylindric to ovoid or ellipsoid, ca. 3–4 mm long, placentation appearing central but capsule valves with septa from base to near apex. Seeds several, deep reddish brown, cylindric or ellipsoid, 1.5–2 mm long, including a short-

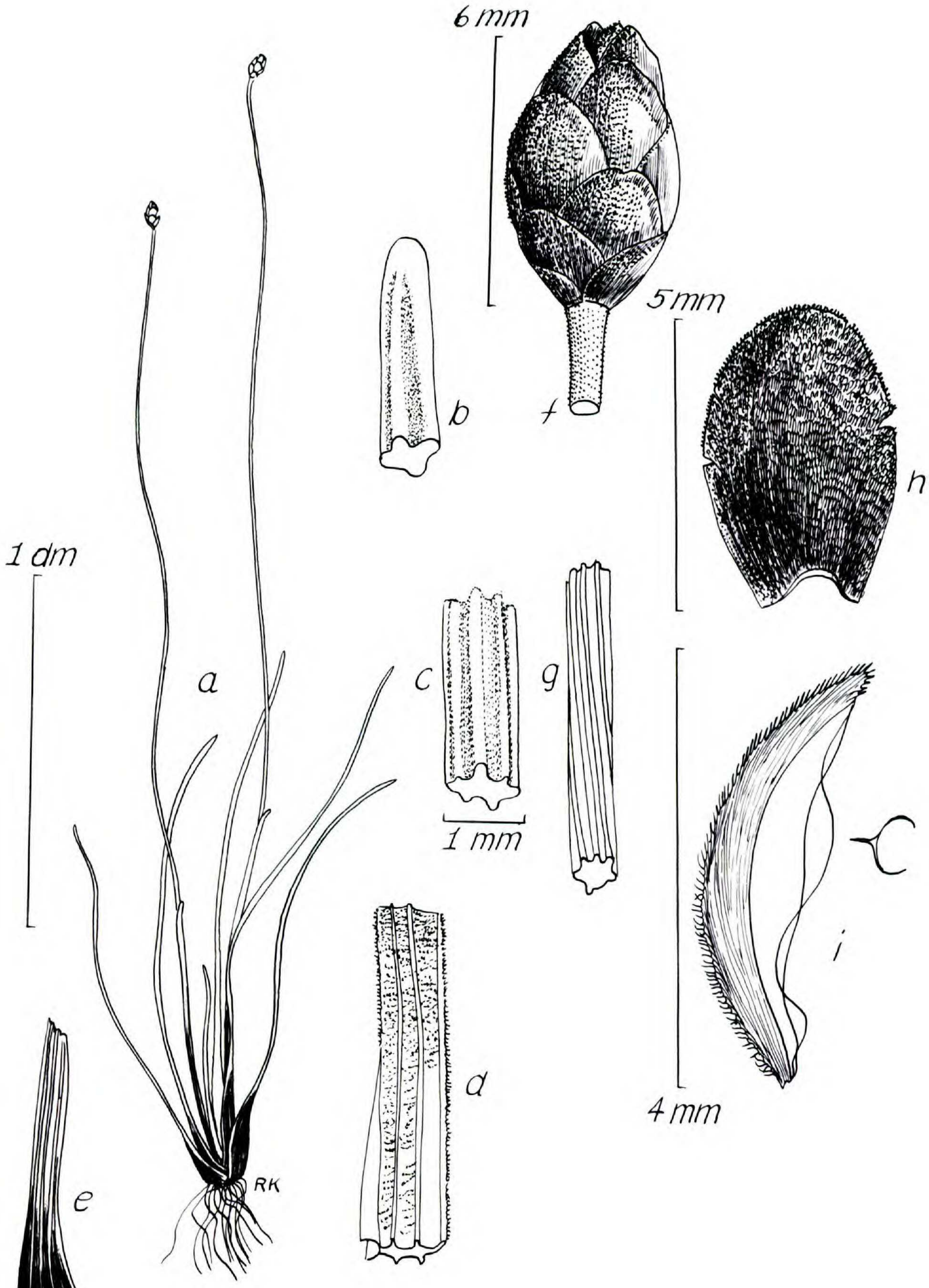


FIGURE 11. Xyris scabridula (Steyermark 58168).—*a. Habit sketch.—b. Leaf apex.—c. Leaf sector at midblade.—d. Leaf blade–sheath junction.—e. Leaf base.—f. Spike, scape apex.—g. Midscape.—h. Fertile bract.—i. Lateral sepal.*

conic, pale appendage, the seed body finely but distinctly longitudinally ribbed.

Distribution. This species appears to be confined to higher elevations in the higher tepuis of Bolívar and T. F. Amazonas, Venezuela (and probably contiguous Brazil), and sorts to four fairly distinct morphologies, here given rank of subspecies, keyed as follows:

KEY TO SUBSPECIES OF *XYRIS ATRICEPS*

1a. Spikes narrowly obovoid; leaf blades lacking sulcus; bracts subentire, with a low costa distally, the bract margins ciliolate with yellowish hairs ..... subsp. *neblinensis*
1b. Spikes narrowly to broadly obovoid; leaf blades sulcate at least ventrally; bracts becoming lacerate, ecostate distally, the bract margins various.
  2a. Spikes under 1 cm long; leaf blades under 1 mm thick; bearded staminodia present.
    3a. Spike broadly obovoid, base strongly attenuate; bract edges distally white ciliate and erect ..... subsp. *atriceps*
    3b. Spike narrowly obovoid or ellipsoid or ovoid, base short-attenuate if at all so; bract edges sordidly villosulous, usually becoming very lacerate, subsquarrose ..... subsp. *chimantensis*
  2b. Spikes 1–1.5 cm long; leaf blades ca. 1 mm thick; staminodia absent ..... subsp. *marahuacae*

12A. Xyris atriceps Malme subsp. **atriceps.** Figure 12A (in part).

Spikes broadly obovoid, attenuate-based, ca. 7 mm long, the bracts erect, the margins white ciliate; staminodial beard present; seeds ca. 1.5 mm long.

Distribution. This subspecies is still known only from southern Cerro Duida, the type area. Additional material from the type area is *Steyermark 58185* (F, US).

12B. Xyris atriceps subsp. **chimantensis** Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 19–20. 1963. TYPE: Venezuela. Bolívar: locally frequent, Río Tirica, 1,925 m, 5 Feb. 1955; Chamantá Massif, *J. A. Steyermark & J. J. Wurdack 485* (holotype, NY; isotype, US). Figure 12A, a–f, g (left)–i (left).

Spikes ellipsoid or narrowly obovoid, ca. 6–7 mm long, acute at base, the bracts loosely imbricate, narrower than in type, the margins at first sordidly villosulous, later becoming much lacerate, spreading; staminodial beard present; seeds ca. 1.5 mm long.

Distribution. Abundant locally in high savanna of Chimantá Massif and taxonomically closest to subsp. *atriceps.* Now frequently collected from the summit elevations of the Massif as follows.

Additional specimens examined. VENEZUELA. BOLÍVAR: *Huber et al. 9066* (NY, VDB, VEN); *Steyermark et al. 115852* (VEN), *128008* (VEN, VDB), *128958* (VEN, VDB), *128810* (VEN), *129908* (MYF, VDB, VEN); *Steyermark 128167* (VEN), *128854* (VEN).

12C. Xyris atriceps subsp. **marahuacae** Kral & Lyman B. Smith, subsp. nov. TYPE: Venezuela. T. F. Amazonas: Dept. Atabapo, Cerro Marahuaca, cumbre, parte central de la meseta Sur-Este, al lado de una grieta, a lo largo de la Quebrada Yekuana, afluente del Río Negro, 3°40′30″N, 65°26′20″W, 2,560 m, 10–12 Oct. 1983, *Steyermark 129579* (holotype, VEN; isotype, VDB). Figure 12B.

Planta fragilis, perennis, caespitosa, 4–5 dm alta, glabra. Radices graciles. Caules breves aut elongatis, usque ad 5 cm longi. Folia principalia erecta, usque ad 3 dm longa, torta, flexuosa, vaginis scaporum longiora; lamine 6–10-plo vaginis longiores, anguste lineares, teretes, 1–3-sulcatae, ca. 0.8–1.2 mm crassae, olivaceae, ad basin ventraliter profunde sulcatae; apices peranguste conici; vaginae ecarinatae, nitidae, atrocastaneae, integrae, ad basin dilatatae, in laminas gradatim, tum abrupte decrescentes, ad apicem ligulatae, ligula rigida erecta linearotriangulata, usque ad 1 cm longa. Vaginae scaporum prope basin castaneae, apicem versus apertae, laminis elongatis, laminis foliorum similibus sed angustioribus. Scapi leviter torti, teretes, ca. 1 mm crassi, multistriati, olivacei vel brunneoli. Spicae multiflorae, anguste vel late obovoideae, ca. 1 cm longae, obtusae. Bracteae erectae, laxe spiraliter imbricatae, firmae, ecarinatae, rigidae, fuliginosae, sine area dorsali, ad apicem villosiciliatae, tum valde laceratae, eciliatae; bracteae steriles ovatae, plures, fertilibus breviores, in fertiles gradatim transientes; bracteae fertiles late obovatae, 7–8 mm longae, ad apicem late rotundatae. Sepala lateralia libera, subaequilatera, oblanceolata, atrobrunneola, 6.5–7 mm longa, leviter curvata, obtusa; ala carinali a medio ad apicem aut solum

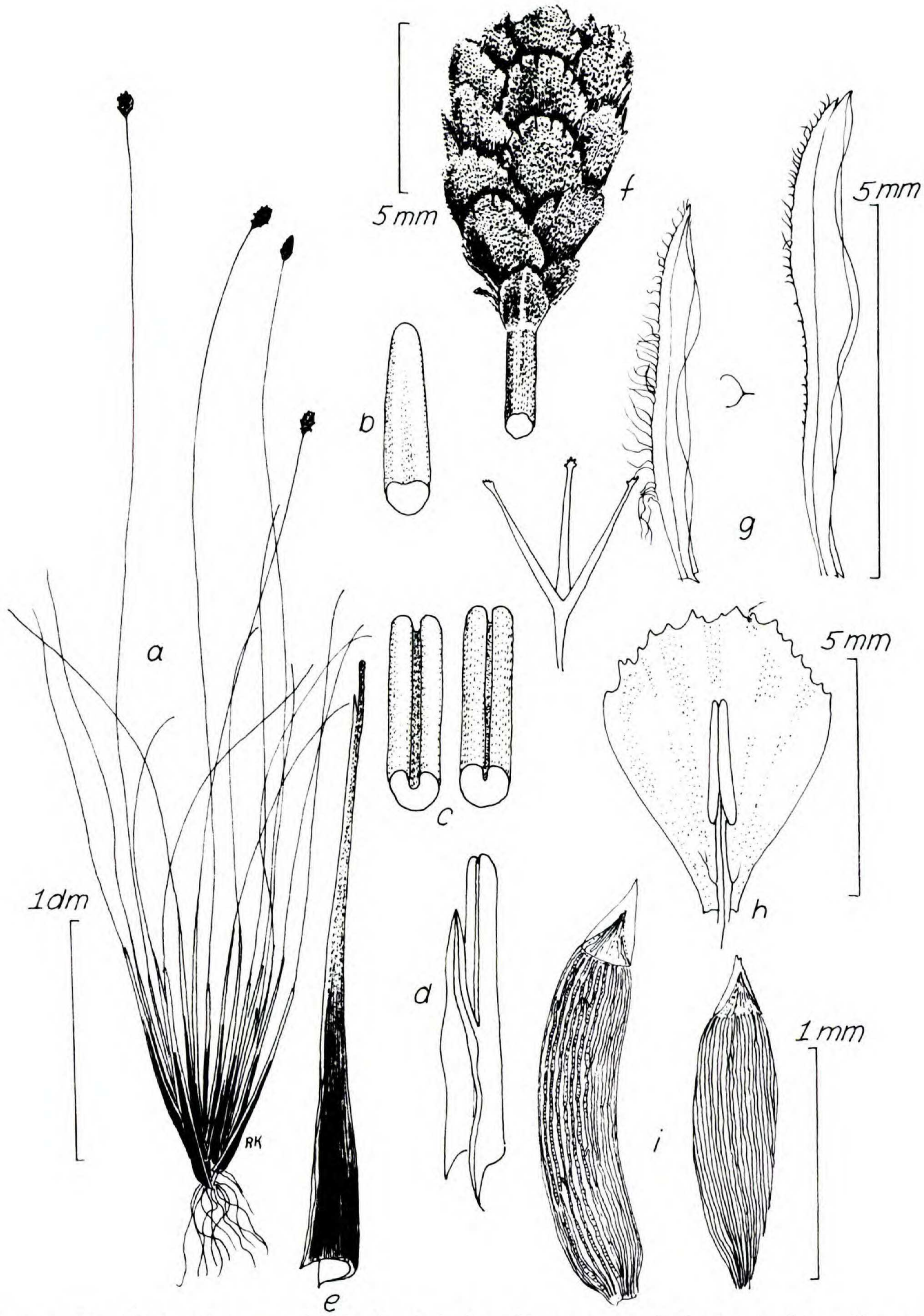
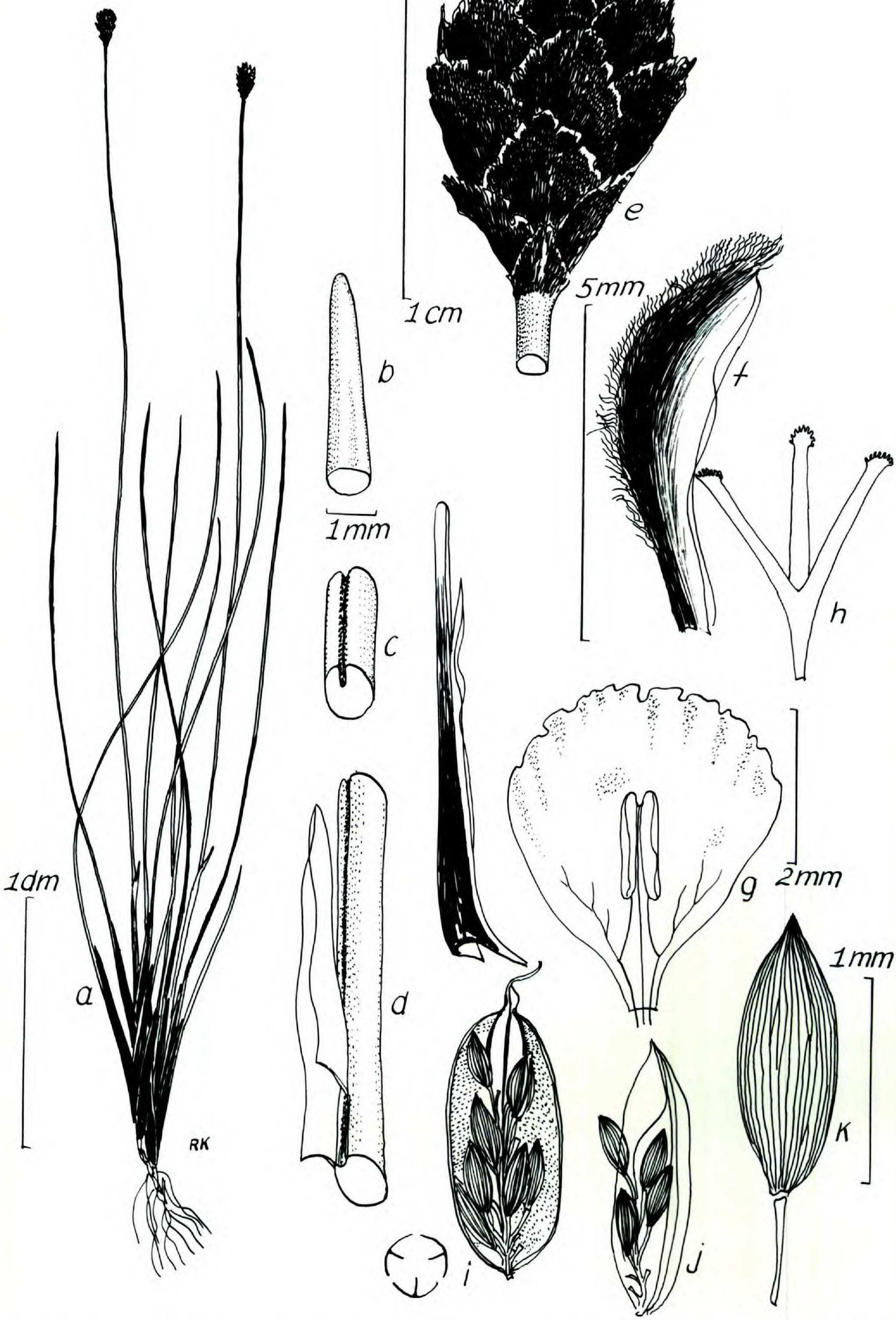


FIGURE 12A. Xyris atriceps.—*a. Habit sketch (subsp.* chimantensis*).—b. Leaf apex (general).—c. Leaf blade, midblade (general).—d. Leaf blade–sheath junction (general).—e. Leaf base (general).—f. Spike (subsp.* chimantensis*).—g. Lateral sepal (at left subsp.* chimantensis, *at right subsp.* neblinensis*).—h. Petal blade, stamen, stylar apex (general).—i. Seeds (at left subsp.* neblinensis, *at right subsp.* chimantensis, *subsp.* atriceps*).*

→

FIGURE 12B. Xyris atriceps *subsp.* marahuacae *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade, midblade sector.—d. Leaf sheath–blade junction (at left); leaf base (at right).—e. Spike.—f. Lateral*



sepal.—g. Petal blade, stamen.—h. Stylar apex.—i. Capsule, idealized section showing two septa (stippled), placentation, vascular supply to funiculi) .—j. Valve removed, showing ovular attachment to inner edge of valve septum.—k. Seed (from quasimature fruit) .

ad apicem villosifimbriolata. Laminae petalorum late obovatae, ca. 6–6.5 mm longae, apice late rotundatae. Staminodia nulla. Antherae oblongae, ca. 2 mm longae, leviter emarginatae et auriculatae; filiis ca. 1.5 mm longis, latis. Capsula matura ellipsoidea, ca. 4 mm longa, valvis capsulae profunde septatis a medio ad basin. Semina numerosa, ellipsoidea, ca. 1.5 mm longa, translucida, longitudine multilineata.

Brittle, tufted, glabrous perennial 4–5 dm high. Roots slender. Stems short or elongate, up to 5 cm long. Main leaves erect, to 3 dm long, twisted, flexuous, longer than the scape sheaths; blades 6–10 times longer than the sheaths, narrowly linear, terete, 1–3-sulcate, ca. 0.8–1.2 mm thick, olive-green, deeply sulcate ventrally at base; tips narrowly conic; sheaths ecarinate, shining, deep castaneous, entire, dilated at base, narrowing gradually, then abruptly, to blades, ligulate at apex, the ligule rigid, erect, linear-triangular, to 1 cm long. Scape sheaths castaneous toward base, opening toward apex, elongate-bladed, with blades similar to those of leaves but narrower. Scapes slightly twisted, terete, ca. 1 mm thick, multistriate, olivaceous to brown. Spikes multiflorous, narrowly to broadly obovoid, ca. 1 cm long, obtuse. Bracts erect, loosely spirally imbricate, firm, ecarinate, rigid, sooty brown, without dorsal area, villous-ciliate at apex, aging strongly lacerate, eciliate; sterile bracts ovate, several, shorter than the fertile bracts and passing gradually into them; fertile bracts broadly obovate, 7–8 mm long, broadly rounded at apex. Lateral sepals free, subequilateral, oblanceolate, deep brown, 6.5–7 mm long, slightly curvate, obtuse; keel villous-fimbriolate from middle to tip or solely at tip. Petal blades broadly obovate, ca. 6–6.5 mm long, broadly rounded apically. Staminodia none. Anthers oblong, ca. 2 mm long, slightly emarginate and auriculate; filaments broad, ca. 1.5 mm long. Quasimature capsules ca. 4 mm long, ovoid, with valves deeply septate from middle to base; seeds numerous, ellipsoid, ca. 1.5 mm long, translucid, longitudinally prominently multilined.

Paratypes. All from the same massif as the type: 2–9 Feb. 1975, *S. S. Tillett et al. 752-333* (NYF, US, VEN); 16 Feb. 1981, *Steyermark et al. 124371* (NY, VDB, VEN); 1–2 Feb. 1982, *Steyermark et al. 126038* (VDB, VEN); 2 Feb. 1982, *Steyermark et al. 126038* (VDB, VEN); 1–2 Feb. 1982, *Steyermark et al. 125992* (VDB, VEN); 9–10 Feb. 1982, *Steyermark et al. 126293* (VDB, VEN); 26 Mar. 1982, *Steyermark & Delascio 129201, 129224* (VDB, VEN); 12–13 Oct. 1983, *Steyermark 129476* (MO, VDB, VEN).

This subspecies, abundant on summits of Cerro Marahuaca, is robust as is subsp. *neblinensis* and has the thickest spikes and leaves, lacks staminodia, and has very distinctively villose sepal keels and tips, with tips of young bracts also densely villous-ciliate.

12D. Xyris atriceps subsp. **neblinensis** Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 19. 1963. TYPE: Venezuela. T. F. Amazonas: Cerro de La Neblina, Río Yatua, locally abundant, east escarpment of Upper Caño Grande basin, at 1,900 m, summit, 1,200–2,200 m, *B. Maguire, J. J. Wurdack & C. K. Maguire 42416* (holotype, NY; isotypes, GH, K, US). Figure 12A, g (right), i (left),

Leaves mostly esulcate; spikes narrowly obovoid, the bracts light brown, entire, with a low costa toward apex, the margin ciliate with short, yellowish hairs. Seeds ca. 2 mm long, the longest in the complex.

Distribution and remarks. This subspecies appears to be relatively common in the high, wet open paramolike summit elevations along the Neblina Massif and has been found by several collectors.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Neblina Massif: *Liesner 16000* (MO, NY, VDB, VEN); *Maguire et al. 37244, 42342* (NY, US); *Steyermark 103966* (NY, US, VEN); *Thomas & Plowman 3080* (MO, NY, VDB, VEN). BOLÍVAR: Chimanta Massif, *Huber et al. 10151* (MYF, VDB, VEN) (intermediate between this and the subsp. *chimantensis*).

13. Xyris involucrata Nees in J. Bot. (Hooker) 2: 397. 1840. TYPE: "British Guiana, *Schomburgk 1054*" (lectotype, K; isolectotypes, K, L). Figure 13.

X. asterocephala Seub. in C. Martius, Fl. Bras. 3(1): 219. 1855.

Solitary or tufted, rather soft-based, stiff, short-lived perennial 2–6 dm high, the stems

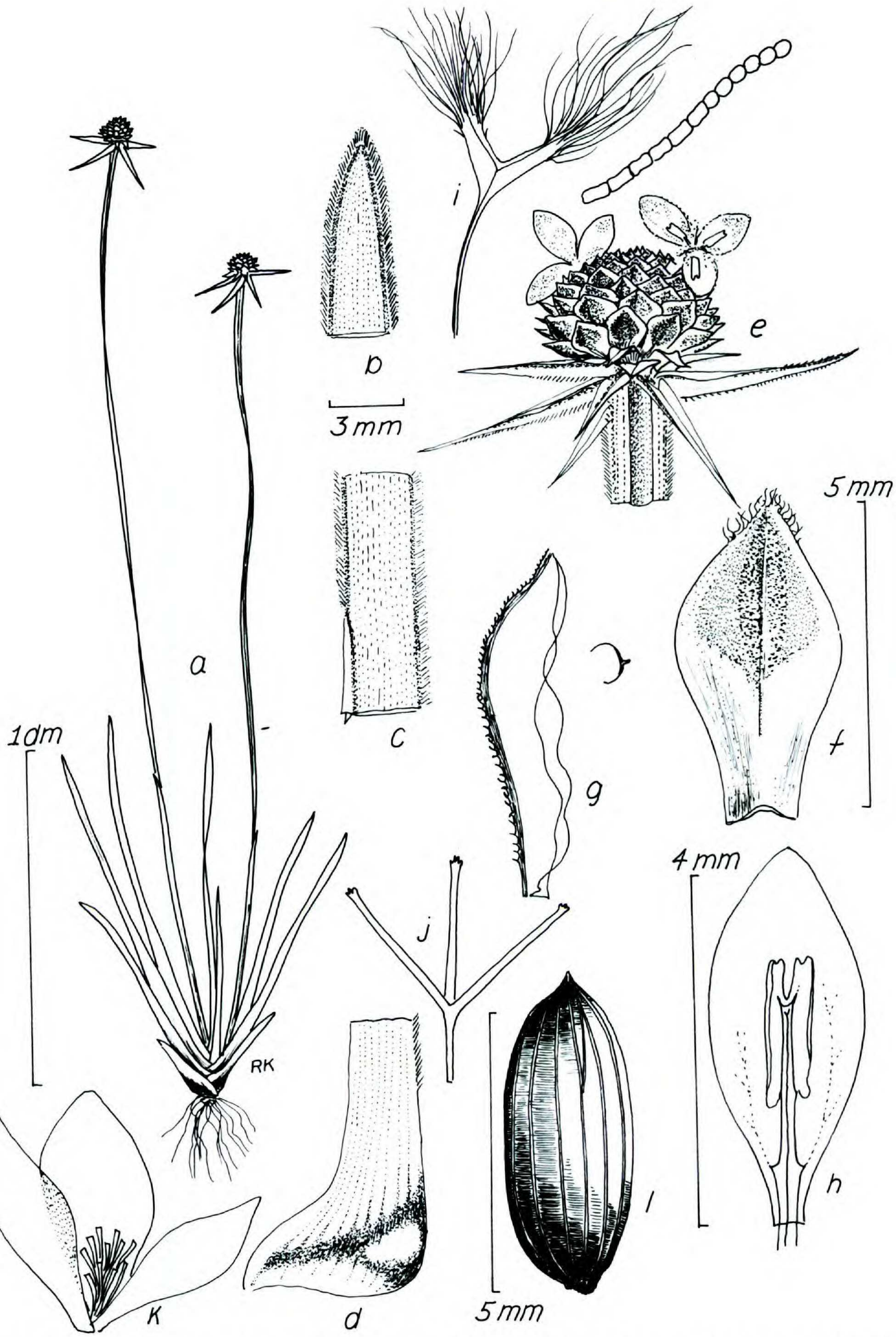


FIGURE 13. Xyris involucrata *(*Koyama & Agostini 7261*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Open capsule.—l. Seed.*

contracted. Leaves spreading flabellately 1–3 dm long, the sheaths entire, equal in length to blade or longer, sharply keeled, often castaneous at very base, abruptly dilated, green or stramineous above, narrowing gradually to blade, eligulate; blades broadly linear, flat, 3–7 mm wide, at apex abruptly rounded or broadly incurved-acute, bright pale green with submarginal reddish borders, edges white-ciliate. Scape sheaths shorter than leaves, sharply keeled, short-bladed. Scapes rigid, straight or slightly twisted, ancipital, strongly flattened distally, 3–4 mm wide, edges pale-ciliate, surface on either side of the strong and subterete scape center low-ribbed, smooth. Spikes hemispherical to broadly ovoid or subglobose, 0.5–1 cm long (sometimes longer in fruit), the bracts in tight flat spirals, the lowest several bracts sterile, foliaceous, spreading leaflike, the bases strongly ciliate-keeled, the blades ciliate as in leaves, the inner sterile bracts progressively shorter, grading into the fertile bracts, the fertile bracts ca. 4(–5) mm long, firm, erect or spreading, rhombic or oblong-obovate, acute or short-acuminate, often villosulous-ciliate at apex, the shallowly convex-rounded backs with a large, medially papillate, rhombic, reddish brown dorsal area, bisected medially by a narrow but evident midrib. Lateral sepals free, subequilateral, oblong-curvate, ca. 3 mm long, blunt, thin, the darker, firm keel reddish ciliate or ciliolate from below middle to tip. Petal blades elliptic, 4–5 mm long, acute, entire, yellow. Anthers oblong, ca. 1.5 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Staminodia bibrachiate, the flat triangular branches apically plumose with penicillate hairs. Capsule broadly obovoid, planoconvex, ca. 2 mm long, the placentation basal, the valves not producing septa. Seeds ellipsoid-cylindric, 0.5–0.6 mm long, apiculate, dark amber, lustrous, longitudinally with a few narrow but distinct ribs and very finely cross-lined.

Distribution. Low- and high-altitude wet savanna (up to 1,500 meters), southeastern Colombia eastward across the Guayanas into Surinam, southward into the Amazon Basin of northern Brazil.

As in the capitate-spiked, involucrate xyrids, this one, which blooms from late morning into the afternoon, has several lovely pale yellow flowers simultaneously. This effect, along with that of the bright pale green, red-bordered leaves and bracts and the gaudy, eryngiumlike inflorescences, makes it one of the more handsome plants of the Guayana boglands. Its affinities are with the recently described *X. egleri* Smith & Downs of Pará, Brazil, a smoother plant with shorter involucral bracts, and with the following species, here described as *X. pallidula*, likewise from Pará.

14. Xyris pallidula Kral & Wanderley, sp. nov. TYPE: Brazil. Amazonas: Mun. Humaita, estrada Humaita–Jacarecanga, km 150, a 60 km ao Sul. Campo natural, solo arenoso. Erva de 40 cm de altura; flores amarelas, 21 June 1982, *L. O. A. Teixeira, A. J. Fife, K. McFarland, C. D. A. Mota, J. L. dos Santos, S. P. Gomes & B. W. Nelson 1263* (holotype, INPA; isotypes, NY, VDB). Figure 14.

Herba perennis, caespitosa, 6–7 dm alta, glabra. Caules breves. Radices graciles. Folia principalia leviter flabellate expansa, 10–17 cm longa, vaginis scaporum parum breviora; vaginae elongatae, integrae, laminis 1–2-plo laminis longiora, pallide rufobrunneolae, e basi ad apicem gradatim decrescentes, eligulatae; laminae valde compressae, anguste lineario-gladiatae, 2–3 mm latae, pallide olivaceae, margine pallide ferruginea, leviter incrassata, papillosa, apice incurvato-acuta. Vaginae scaporum basin versus multicostatae, ferrugineae, nitidae, apicem versus valdae carinatae, lamina ut in laminis foliorum sed breviore. Scapi rigides, lineares, leviter torti, pallide olivacei, apicem versus in sectio transversali elliptici, laterale valde acute bicostati. Spicae multiflorae, late ovoideae vel turbinatae ad hemisphericae, ca. 10 mm longae, involucratae, pallide brunneolae. Bracteae involucrales plures, expansae, subuliformes, 7–15 mm longae, abrupte in bracteas spicae transientes; bracteae spicae rhomboideo-obovatae, 5–7 mm longae, firmae, ad apicem acuminato-subulatae, integrae, sine area dorsali. Sepala lateralia libera, aequilateralia, valde curvata, oblonga, 4–5 mm longa, obtusa, ad apicem albovillosiciliata, ala carinali ciliati, apicem versus persaepe rufofimbriolati. Laminae petalorum obovatae, luteolae, ca. 5 mm longae, acutae, integrae. Staminodia bibrachiata longipenicillatis. Antherae oblongae, vadosae bifidae et sagittatae, ca. 1 mm longae, filiis ca. 0.5 mm longis. Capsula et semina non visa, sed placenta basalis.

Cespitose, smooth perennial 6–7 mm high. Stems short. Roots slender. Principal leaves

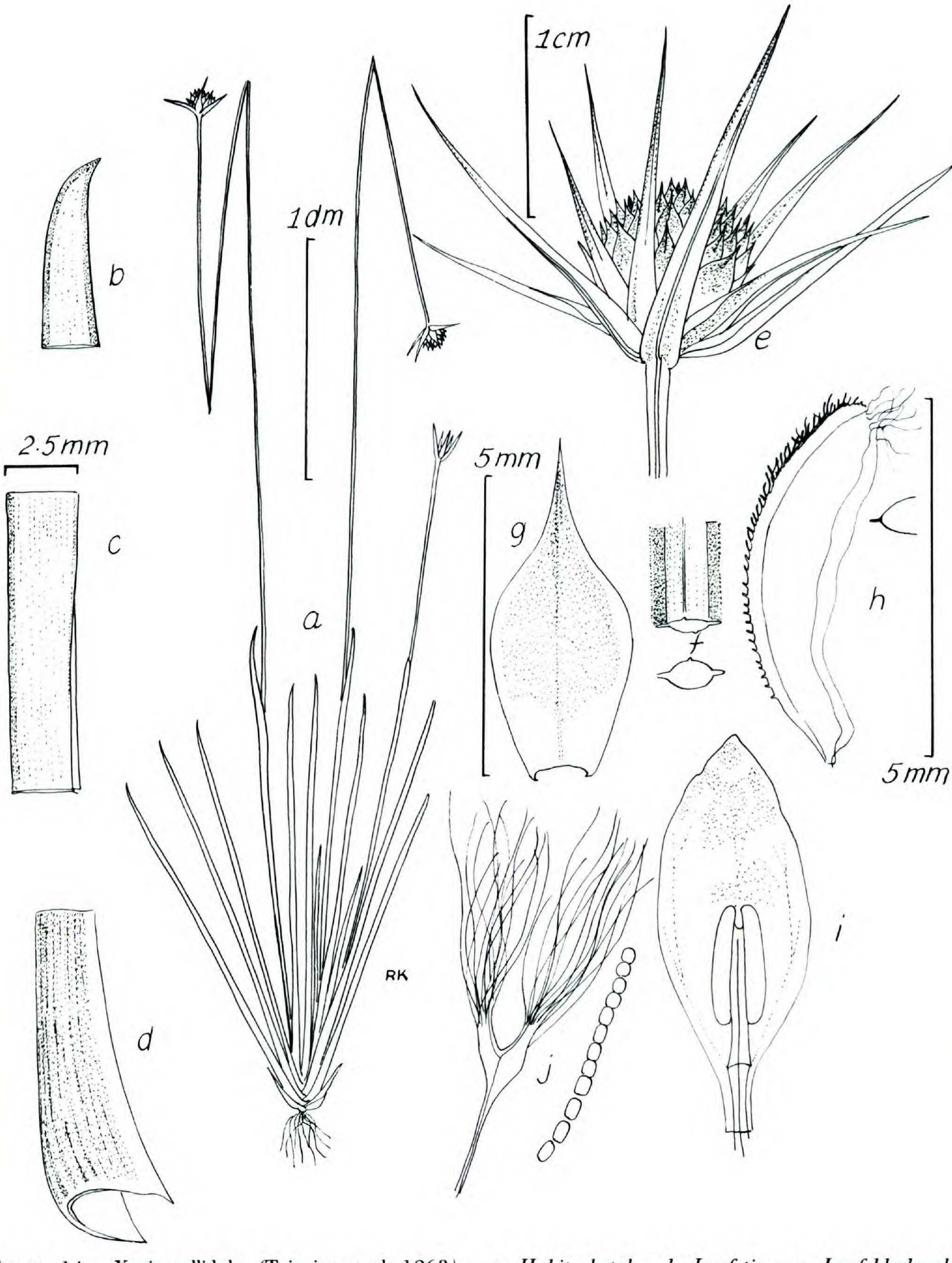


FIGURE 14. Xyris pallidula (Teixeira et al. 1263).—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Upper scape.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode and beard hair.*

slightly spreading flabellately, 10–17 cm long, somewhat shorter than the scape sheaths; sheaths elongate, entire, 1–2 times longer than the blades, pale reddish brown, gradually narrowing from dilated base to apex, eligulate; blades strongly flattened, narrowly linear-gladiate, 2–3 mm wide, pale olive, the margins pale red-brown-bordered, slightly thickened, papillose, the apex incurved-acute. Scape sheaths multicostate toward base, reddish, shining, strongly carinate toward apex, with blade as in leaves but shorter. Scapes rigid,

linear, slightly twisted, pale olive, mostly elliptic in cross section toward apex, strongly and acutely bicostate laterally. Spikes multiflorous, broadly ovoid to turbinate or hemispheric, ca. 10 mm long, involucrate, pale brown; involucral bracts several, spreading, subulate, 7–15 mm long, abruptly grading into bracts of spike; spike bracts rhombic-obovate, 5–7 mm long, firm, apically acuminate-subulate, entire, without dorsal area. Lateral sepals free, equilateral, strongly curvate, oblong, 4–5 mm long, obtuse, white-villous-ciliate at apex, the keel ciliate, frequently red-fimbriolate toward apex. Petal blades obovate, yellowish, ca. 5 mm long, acute, entire. Staminodia bibrachiate, long-penicillate. Anthers oblong, shallowly bifid and sagittate, ca. 1 mm long, the filaments ca. 0.5 mm long. Fruit and seed not seen, placentation basal.

This species, yet known only from the type material, is clearly related to the widespread *X. involucrata* but is easily distinguished by the lack of a castaneous "patch" on the leaf sheath base, by the eciliate leaf blades and bracts, and by the definitely subulate-tipped spike bracts.

15. Xyris bicephala Gleason, Brittonia 3: 155. 1939. TYPE: Venezuela. Bolívar: Auyan-tepui, 220 m, Gran Sabana, Dec. 1937–Jan. 1938, *G. H. H. Tate 1114* (holotype, NY). Figure 15.

Robust, cespitose, thick- and hard-based perennial 2.5–10 dm high, the stems stout, short or elongate to 2 dm. Leaves spreading flabellately, 2–5 dm long; sheaths with entire margins, castaneous or near black, ⅔ or more as long as blades, tapering evenly to blade, there imperceptibly short-ligulate; blades broadly linear, flat, 5–10 mm wide, the apex abruptly narrowed and rounded, incurved-acute, or narrowly rounded, the edges densely pale-pilose, densely ciliate or ciliolate, surfaces deep green, low-nerved. Scape sheath loose, shorter than leaves, distally ciliate-carinate, short-bladed. Scape flattened-ancipital, densely albociliate, 2.5–4 mm wide, bispicate (rarely monospicate). Spike broadly ovoid, obovoid or subglobose, 0.8–1.5 mm long, deep brown or castaneous, the bracts rigid, with or without a small, paler, elliptic, subapical dorsal area; sterile bracts many, ovate-triangular, smaller than and grading into the numerous fertile bracts, these broadly elliptic-ovate to oblong, 5–8 mm long, narrowly to broadly rounded, entire to erose or finely lacerate (rarely also red-ciliolate), lustrous toward base, dull toward tip, backs slightly rounded, ecarinate. Lateral sepals free, equilateral, linear-oblanceolate and often excurvate, 5.5–6.6 mm long, pale brown with firm, dark keel, this red-ciliolate or red-fimbriolate from middle to apex. Petal blades broadly obovate, 5.5–6 mm long, yellow, apically obtuse and erose. Staminodia bibrachiate, the slender branches long-villous-penicillate from base to tip. Anthers oblong, emarginate and auriculate, ca. 2 mm long, on filaments ca. 1 mm long. Capsule narrowly ellipsoid, 4–4.5 mm long, the placentation basal-axile (septa detaching from central axis and falling with valves). Seeds few, cylindric-fusiform, often curvate, 2.5–3 mm long, including a pale, narrowly conic appendage (separated outer integument), and with numerous pale, flattened, longitudinal ribs.

Distribution. Common in boggy rapateaceous savanna at medium to high elevations, the Guayana Highland of Estado Bolívar, Venezuela, eastward into the Pakaraima Mountains of Guayana.

This, the only known species of bispicate *Xyris*, unfolds its pale yellow blooms in the morning. Its dark bracts usually have inconspicuous but often detectable dorsal areas. It may intergrade with *X. decussata* Gl. and with *X. albescens* Steyerm., both of which it strongly resembles in bract and seed characters. It and several other species of the Guayana Highlands hitherto considered part of a well-defined section, "*Nematopus*," are showing septate ovary and fruit, and axile placentation.

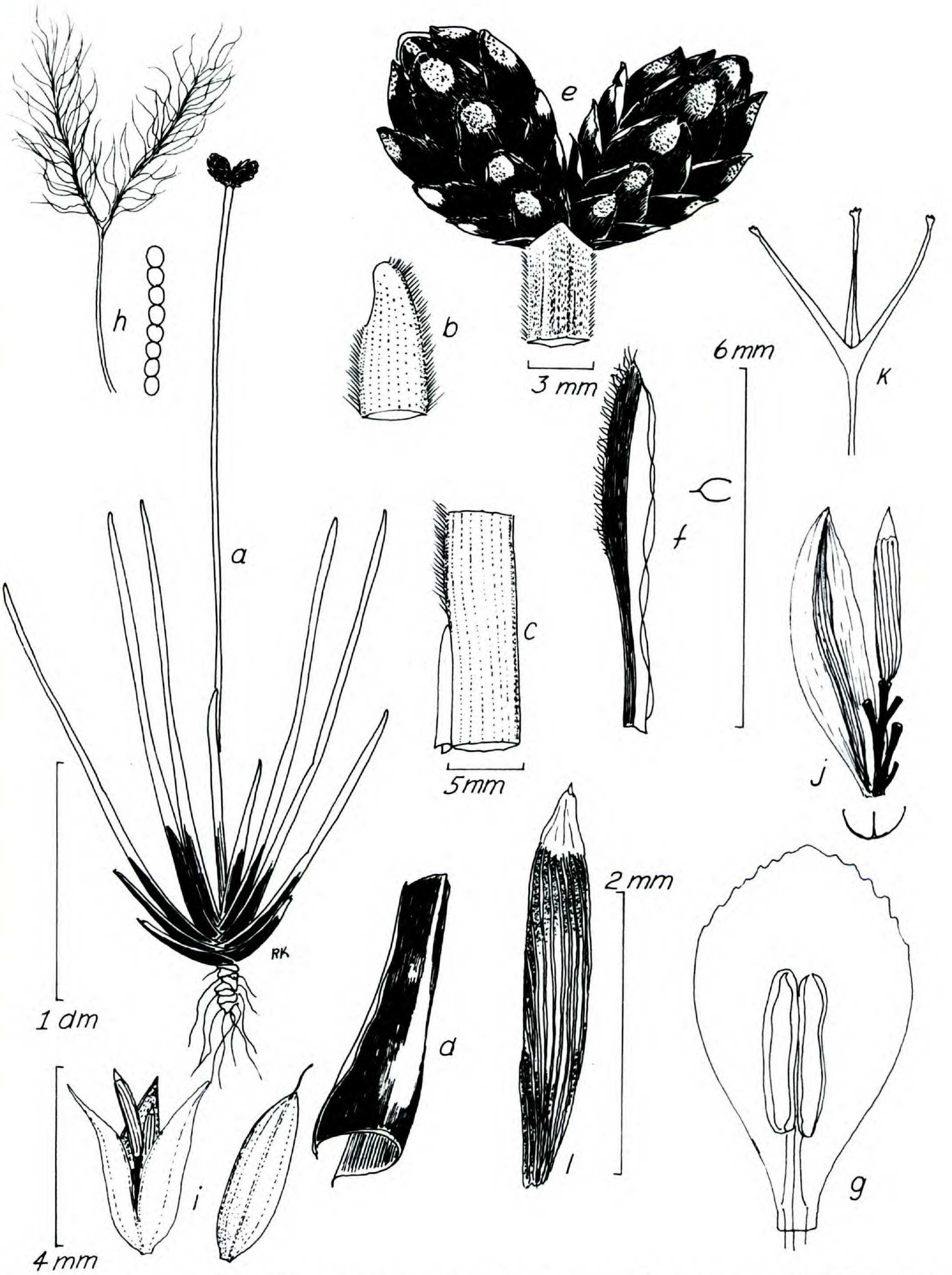


FIGURE 15. Xyris bicephala *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spikes.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode, enlarged sector of hair.—i. Opening (left) and closed (right) capsule.—j. Capsule, showing one valve, placenta.—k. Style apex.—l. Seed.*

16. Xyris teinosperma Idrobo & Lyman B. Smith, Caldasia 6: 224. 1954. TYPE: Colombia. Vaupés: Yapoboda, 10 Dec. 1943, *P. M. Allen 3195* (holotype, COL; isotype, MO). Figure 16.

Sturdy solitary to densely cespitose perennial 5–8 dm high, the stems short and stocky. Leaves mostly spreading flabellately, 4–6 dm long; sheaths entire, in longer leaves less than ½ as long as blades, the dilated bases castaneous and lustrous, upwardly green or stramineous, keeled, tapering evenly to blades, there eligulate or with a narrow thin ligule to 3 mm long, the blades linear, flattened, straight and stiff, 4–10 mm wide, tapering slightly above middle then abruptly narrowed at apex to an incurved or erect, narrowly rounded or broadly acute, thickened tip; margins cartilaginous-thickened, pale, smooth; surfaces deep yellow-green, finely nerved, smooth. Scape sheaths much shorter than leaves, closed below, multicostate, distally keeled, open and with a stubby blade. Scapes distally ancipital, 3–4 mm wide, with 2 smooth costae making edges, surfaces yellow-green, striate, smooth. Spikes ovoid, 2–3 cm long, acute, of very many firm, tightly spirally imbricate bracts, these brown with conspicuous paler dorsal areas; sterile bracts many, the lowest much smaller than the fertile bracts, triangular-ovate, keeled, grading into fertile bracts, these oblong to obovate, ecarinate, 10–15 mm long, apically narrowly rounded and subentire. Lateral sepals free, subequilateral, linear-oblanceolate, 10–11 mm long, acute, the wide keel above middle finely lacerate and/or villosulous, aging subentire. Petal blades broadly oblong-elliptic, 1–1.2 cm long, yellow, the broadly rounded apex erose. Anthers oblong-linear, ca. 3.5 mm long, deeply bifid and sagittate, on filaments ca. 1.5 mm long. Staminodia multibrachiate, the slender branches densely plumose with long, penicillate hairs. Capsule narrowly ellipsoid, 8–10 mm long, the massive placenta basal, the valves dehiscing to reveal deep septa at base. Seeds several on short, bulbous funicles, linear, ca. 3 mm long, including an apical coma of pale, narrow, erect squamellae ca. 1 mm long, the narrow, pale brown seed body with a few strongly raised, pale, short-squamellate ribs.

Distribution. Wet, low savanna in SE Colombia, SW Venezuela, and contiguous Amazonas, Brazil.

This is one of the most distinctive species of *Xyris*, particularly noticeable in the low savannas along the upper Río Orinoco. Its slender, long-comose seeds are the longest known for the genus; its lovely pale yellow petal blades, unfolding in midday, form the largest known flower in *Xyris*.

17. Xyris lomatophylla C. Martius, Flora 24(2): 57. 1841. TYPE: Colombia. Amazonas: "In campis, Arara Coará, *Martius*" (lectotype, M; phototype, GH). Figure 17.

Robust, stiff, hard-based, solitary to cespitose perennial 5–7 dm high, the stems contracted. Leaves spreading flabellately, 0.5–3 dm long; sheaths eciliate, cartilaginous-keeled, fully the length of the blades, abruptly dilated at very base, dark brown or castaneous, shading distally to brown, narrowing gradually upward into blade, there with a short, narrowly triangular, erect ligule; blades flattened, twisted, ensiform, mostly 3–5 mm wide, narrowly acute or abruptly narrowly rounded, with a pale-cartilaginous-thickened, smooth or (frequently) ciliolate border, the surface smooth, finely nerved, dark green. Scape sheaths slightly shorter than leaves, twisted, proximally dark red-brown, keeled, with a cartilaginous costa, distally with a strong, short blade like that of leaves. Scape twisted, straight or flexuous, distally terete or oval in cross section, 1–1.5 mm wide, ecostate, smooth, longitudinally striate. Spikes dull brown, ovoid to cylindrical, 1–3 cm long, blunt, base attenuate or broadly rounded, with many spirally imbricate bracts with large, deep brown, apically broadened dorsal areas and broad, wooly-villous margins; sterile bracts many, the lowest much smaller than the fertile bracts,

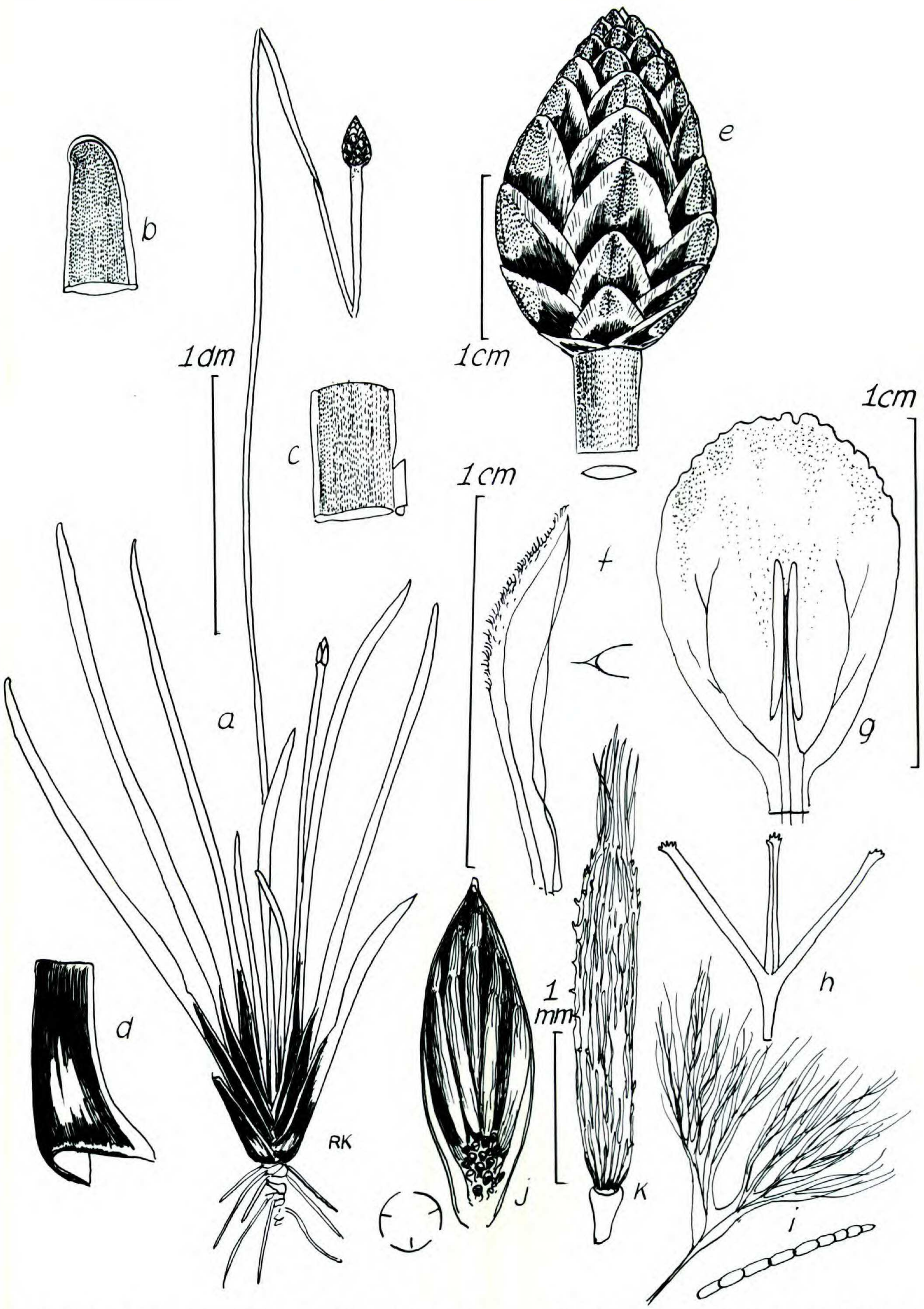


FIGURE 16. Xyris teinosperma (Kral & Huber 70708).—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Stylar apex.—i. Staminode, enlarged tip of beard hair.—j. Capsule, one valve removed to show placentation.—k. Seed.*

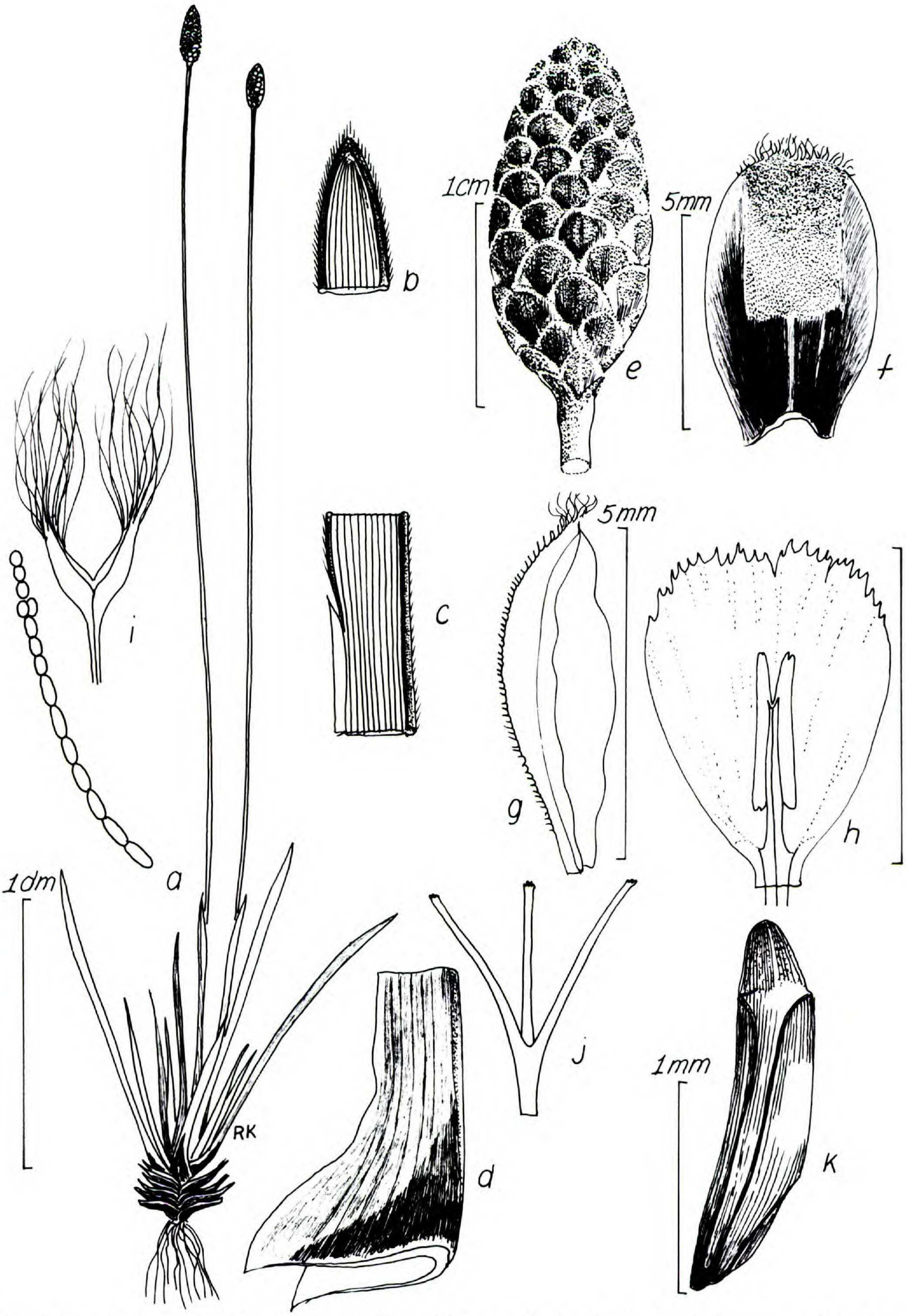


FIGURE 17. Xyris lomatophylla (Huber & Tillett 3058).—*a. Habit sketch.—b. Leaf apex.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Seed.*

ovate, slightly keeled, grading gradually larger to fertile bracts, these obovate or broadly elliptic, 7–7.5 mm long, ecarinate. Lateral sepals free, very inequilateral, oblong-curvate, ca. 6 mm long, blunt, lustrous-brown, thin, the wide, firm keel increasingly densely brown-ciliate from near base to tip, there frequently villous-fimbriate. Petal blades broadly obovate, yellow, to nearly suborbicular, ca. 5 mm long, the broadly rounded apex lacerate. Staminodia bibrachiate, the flat, narrowly triangular branches tipped with a dense tuft of penicillate hairs. Anthers lance-oblong, ca. 2.5 mm long, deeply bifid and sagittate, on filaments 0.5 mm long. Capsule ellipsoid, planoconvex, ca. 3–4 mm long, the placentation basal, the valves without septa. Seeds few, cylindrical, 2–2.5 mm long including a white, conic apiculus ca. 0.5 mm long, pale amber, longitudinally finely lined, coarsely overlain by a few prominent dark ribs.

Distribution. Low, wet, sandy savanna, Amazonian southeastern Colombia through the savannas along the upper Río Orinoco and the Río Negro, T. F. Amazonas, Venezuela, southeastward into Pará, Brazil.

Additional specimens examined. BRAZIL. PARÁ: campo inundavel, Missão Velha, Rio Cururu, Alto Tapajós, 19 July 1959, *Egler & Raimundo 952* (US). "*Xyris lomatophylla* Mart. Brasilia prov. Río Negro, Legit *Martius*, Herbar. reg. Monacense Duplum 1864," attributed to Brazil but according to Dr. L. B. Smith, actually Colombian.

In spike character this species most resembles *X. globosa* but differs in its (usually) more elongate spikes; broader, flatter, cartilaginous-bordered leaves; and longer, narrower seeds. In the Venezuelan savanna along the upper Río Orinoco it may be the dominant species.

18. Xyris contracta Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 33. 1963. TYPE: Venezuela. T. F. Amazonas: Cerro de La Neblina, Río Yatua, summit, 1,200–1,300 m, flowers yellow; infrequent in stream bed, upper Cañon Grande, 1,900 m, 11 Dec. 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 42359* (holotype, NY; isotypes, US, VEN). Figure 18.

Cespitose, thick-based, smooth perennial 2–3(–5.5) dm high, the stem short, to ca. 3 cm long. Leaves ascending, 1–2(–3) dm long; sheaths entire, less than ½ as long as blades, lustrous at base, deep red-brown, dorsally rounded-convex, firm, narrowing gradually and keeled to blade and with a prominent, erect, broadly oblong, blunt ligule 2.5–3 mm long; blade narrowly linear, ca. 1(–3) mm wide, flat, acute at apex, the margins without border, entire, surfaces finely nerved, green. Scape sheath slightly to much shorter than leaves, proximally maroon or castaneous, opening distally, green, producing a strong blade. Scapes linear, straight, distally terete, ca. 1 mm thick, ecostate or with 1–2 very low, smooth costae, or flattened and 2-edged, to 2 mm wide. Spikes ellipsoid, ca. 1.5 cm long, acute, dull red-brown with numerous bracts in several subvertical ranks. Sterile bracts several, lowest keeled, slightly smaller than the fertile bracts and grading into them; fertile bracts oblong, 7–8 mm long, strongly rounded-folded, ecarinate, subentire, apically rounded-emarginate, when young frequently villose-ciliate apically, all with pale, subapical, somewhat indistinct, elliptic dorsal areas. Lateral sepals free, subequilateral, oblanceolate-linear, 7–8 mm long, straight, pale red-brown, the wide, thin keel ciliolate or papillate from middle to apex, or at apex also sparsely red-villosulous. Petal blades broadly obovate or reniform, ca. 7–8 mm long, yellow, the broadly rounded apex lacerate. Staminodia bibrachiate, the branches long-penicillate. Anthers ca. 2.5 mm long, oblong, on filaments ca. 1 mm long. Capsule ellipsoid, 4–4.5 mm long, septa lacking, the placentation basal. Seeds numerous, ellipsoid-fusiform, ca. 2 mm long, including a narrowly conic, pale apiculus ca. 0.4 mm long, the body dark, translucent, longitudinally prominently several-ribbed, with occasional cross-ribs.

Distribution. So far known only from the type area, re-collected there by Steyermark (*104018*, US, VEN) and on the Bra-

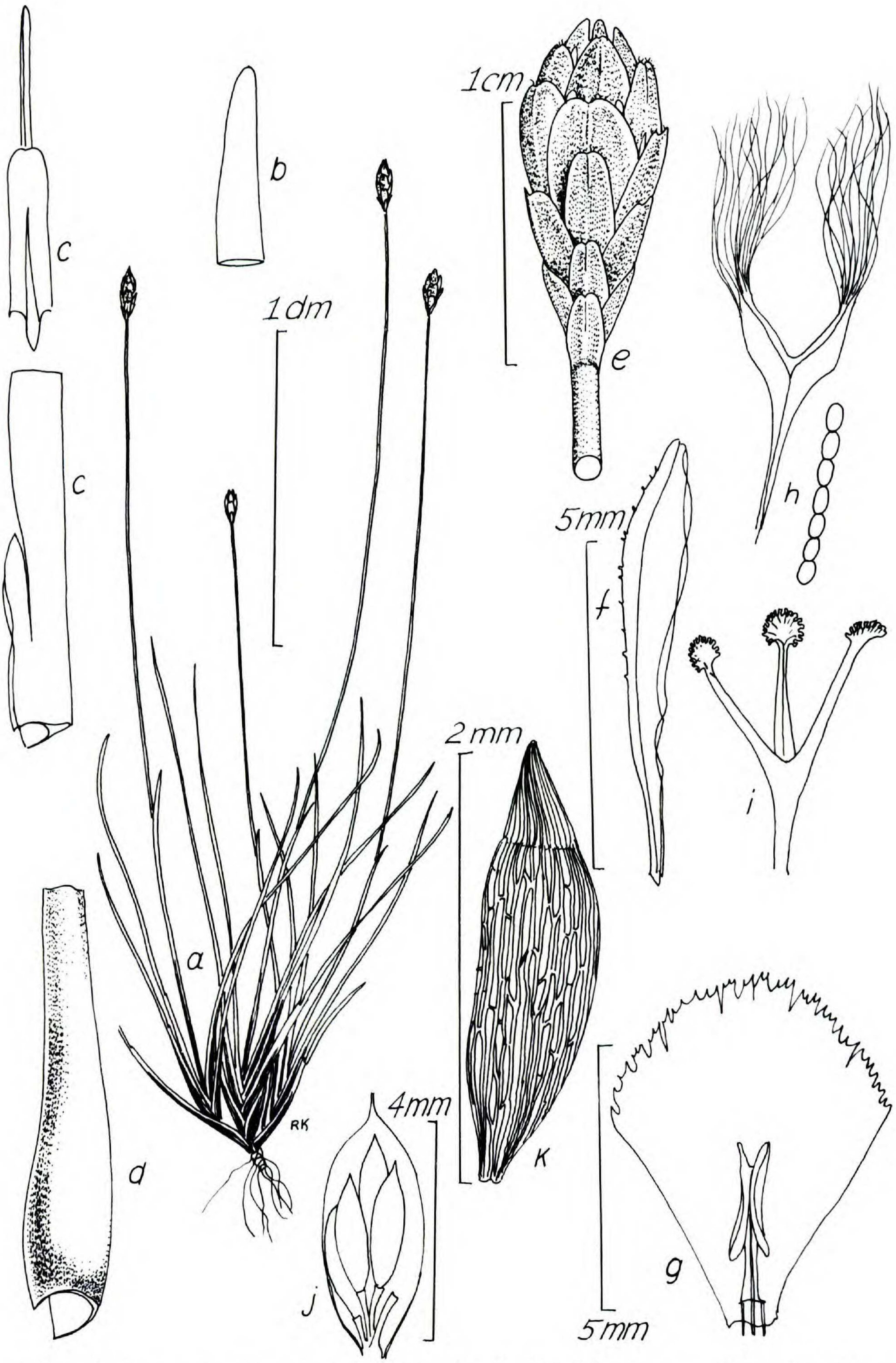


FIGURE 18. Xyris contracta *(from the type)*.—*a. Habit sketch.—b. Leaf tip.—c. Adaxial (inside) view of leaf–sheath junction and side view of same.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode, enlarged sector of beard hair.—i. Stylar apex.—j. Capsule, one valve removed.—k. Seed.*

zilian side of the Neblina crest (Rio Cauaburi, Brazil, *Maguire et al. 60483*, NY).

This rare plant is very distinctive in its combination of narrow, smooth leaves, dark, lustrous, ribless sheath bases, contracted leaf blade base, large ellipsoid spikes, and distinctive seeds. The only exceptional material is that collected by Steyermark which, while definitely this species, is a longer- and wider-leaved extreme with scapes distally flattened and 2-edged, much wider than in the type. I have not seen any further collections of this among many recent collections made by the Neblina workers.

19. Xyris seubertii Nilsson, Sv. Vet. Akad. Handl. 24(14): 51, pl. 4. 1892. TYPE: Guyana: "British Guiana, Rich. *Schomburgk n. 897*" (phototype, US). Figure 19.

X. calcarata Heimerl, Ann. Naturhist. Hofmus. Wien 21: 68, pl. 4, f. 1–3. 1906. TYPE: Brazil: *Tamberlik s.n.* (W—lost; phototype, F).

Slender, solitary to cespitose, hard-based, smooth and glaucous perennial 2–7 dm high, the stems contracted. Leaves spreading flabellately, 0.5–2.5 dm long; sheaths eciliate, at very base abruptly dilated, castaneous to dull, dark brown, above pink or pale purple, sharply keeled, narrowing gradually to blades, often ½ or more as long as blades, at apex producing a narrowly triangular, erect or spreading ligule or tapering directly into blade; blades linear-ensiform, flattened, straight or slightly twisted, 1.5–3.5 mm wide, narrowing above middle gradually into an incurved-acute or acuminate tip, the margins thin, entire to papillose, tuberculate, or scabridulous-ciliolate, the surfaces green, smooth, finely multinerved. Scape sheaths often as long as leaves, tubular and multicostate toward base, often rose or purple, ribbed, above open, keeled, with short, flat blades similar to those of leaves. Scapes straight or flexuous, twisted, subterete toward apex, 0.5–0.7 mm thick, ecostate or with 1 or more costae and striate, mostly smooth. Spikes ovoid, broadly ellipsoid or suborbicular, 0.8–1.2 cm long, pale brown, of many spirally imbricate bracts with distinct though narrow dorsal areas, the sterile bracts few, broadly rounded, slightly shorter and narrower than the fertile bracts but with 1 or 2 of the lowest often with dorsal areas prolonged as cusps or short blades equaling or exceeding spike; fertile bracts strongly convex-backed, obovate, 5–6 mm long, broadly rounded at apex, sometimes with apical, red-villosulous tuft. Lateral sepals ca. ⅕–⅓ connate, inequilateral, lanceolate, 6–6.5 mm long, blunt, slightly exserted, thin, the tan, firm keel above middle to apex increasingly densely reddish villous. Petal blades broadly obovate to reniform, ca. 6–7 mm long, yellow, the very broadly rounded apex wavy-erose. Staminodia bibrachiate, the branches long-penicillate. Anthers narrowly oblong, ca. 2 mm long, deeply bifid, deeply sagittate, on filaments ca. 1 mm long. Capsule obovoid, ca. 3 mm long, placentation free-central, the valves without septa. Seeds numerous, broadly ellipsoid to ovoid, ca. 0.3–0.4 mm long, apiculate, amber, finely striate-reticulate.

Distribution. Abundant and widespread from the Gran Sabana of Estado Bolívar, Venezuela, eastward into Guyana, increasingly abundant south of the Amazon Basin in the Brazilian planalto southward to São Paulo.

This species is distinctly weedy, often a pioneer in mechanically disturbed, eroded, or burned savanna. Its glaucous foliage and rather pale yellow flowers, which unfold in late morning, make it particularly handsome.

20. Xyris huberi Kral & Lyman B. Smith, nom. nov. TYPE: Venezuela. T. F. Amazonas: Cerro Yapacana, en la sabana grande entre el Caño Cotua y el pie del cerro, 3°45′N, 66°45′W, 125 m, 7 May 1970, *J. A. Steyermark & G. Bunting 103241* (holotype, US; isotype, VEN). Figure 20.

X. foveolata Kral & Lyman B. Smith, Phytologia 53: 435–436. 1983, non Irmscher.
X. yapacanensis Steyerm. & Lyman B. Smith, nom. nud.

Short-lived, cespitose, lustrous perennial from a short, thick, subvertical rhizome, the

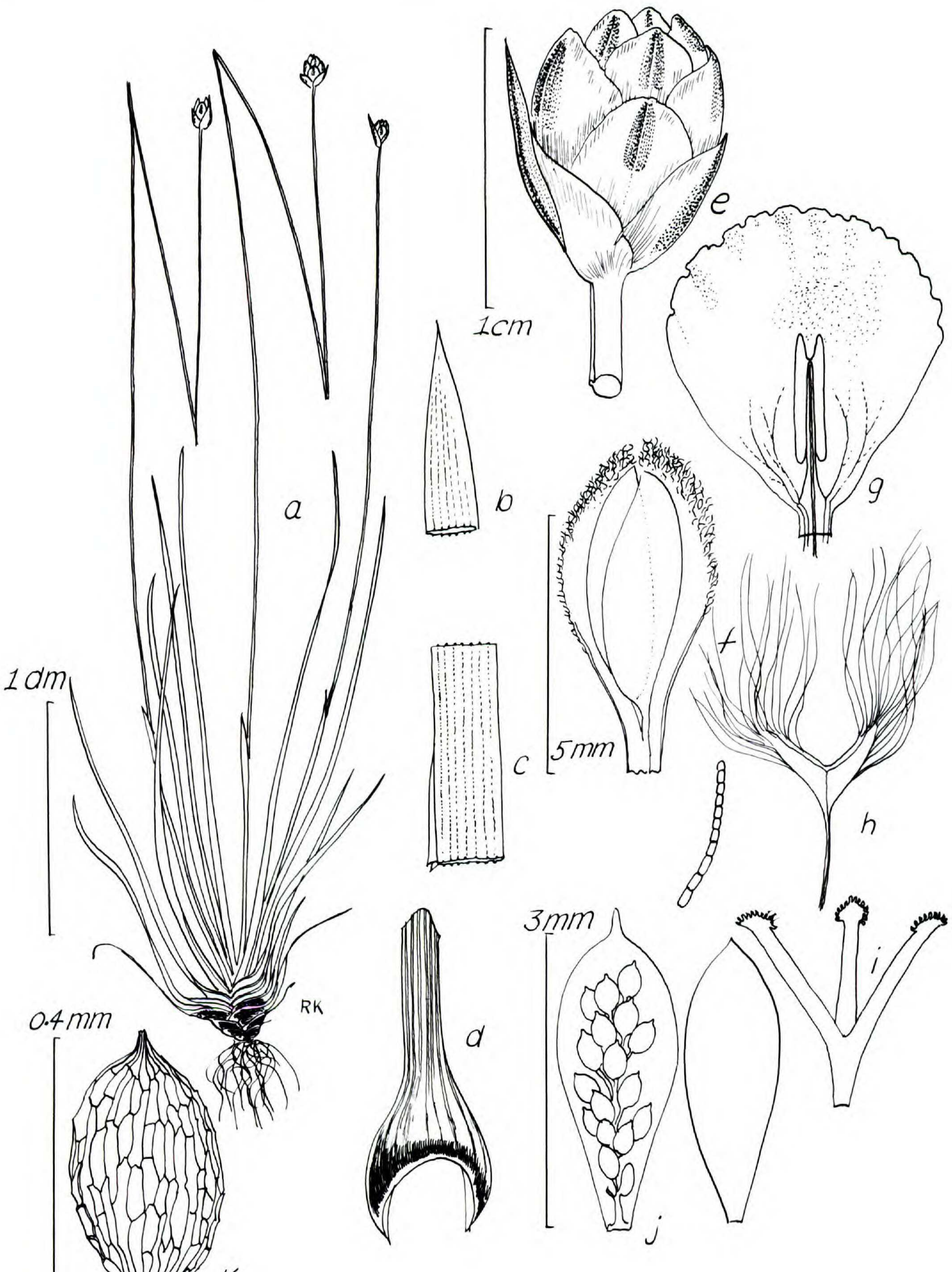


FIGURE 19. Xyris seubertii (Kral 70579).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal (pair, connate).—g. Petal blade, stamen.—h. Staminode, beard hair.—i. Stylar apex.—j. Capsule, placentation, one valve removed, one valve outline.—k. Seed.*

roots slender. Leaves ensiform-linear, (7–)8–15(–16) cm long, spreading flabellately, longer than the scape sheaths; sheaths entire, carinate, the carinae ciliate-scabrid, the sides deep brown, narrowing from the dilated, castaneous base gradually to the blade, there the edges converging to form a triangular, linear-acute, slightly spreading ligule 1.5–2 mm long; blades equal to or twice as long as sheaths, flat or somewhat twisted, strongly compressed, 1.5–2 mm wide, the surfaces green, tinged with brown or rusty brown, punctate (stomata depressed), longitudinally multinerved; apices narrowly acute, erect or incurved, slightly thickened; margins thickened, yellowish, densely pale ciliate with antrorse hairs. Sheaths of scapes multicostate, twisted, carinate, the carinae ciliate, the blades short, similar to leaf blades. Scapes 1.5–2.5 dm high, straight or somewhat flexuous, slightly twisted, distally 1–1.5 mm wide, punctate, bicostate, brownish, ancipital, the edges antrorsely long-ciliate. Spikes obovoid, 6–7 mm long, obtuse, few-flowered, bracts loosely imbricate, subdecussate, with scarious, reddish brown, revolute, ciliate borders and large, pale brown dorsal areas; sterile bracts 2–4, the lower pair oblong-triangular, 4–5 mm long, strongly carinate, the inner pair absent or ovate-triangular, ecarinate, the backs low-rounded, 1-nerved; fertile bracts narrowly ovate, narrowly rounded-folded, ca. 5 mm long, toward apex subcuculate, strongly papillose. Lateral sepals free, equilateral, somewhat curved toward base, lance-linear, ca. 4 mm long, narrowly rounded, acute or bidentate at apex; keel firm, entire toward base, ciliate from middle to apex. Petal blades obovate, ca. 5 mm long, pale yellow, the broadly rounded apex lacerate. Staminodia bibrachiate, the branches long-penicillate apically. Anthers linear-lanceolate, ca. 1.5 mm long, deeply bifid and sagittate on filaments ca. 1 mm long. Capsule narrowly obovoid, 2.5 mm long, the valves eseptate, the placentation basal. Seeds cylindric-fusiform, amber, 1.3–1.4 mm long, longitudinally spirally anastomosing-lined, with a few stronger, darker ribs.

Distribution. Confined to low-elevation savanna along the upper Río Orinoco and tributaries, T. F. Amazonas, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Dept. Atabapo, Cerro Yapacana, 3 June 1978, *Huber 2030* (VEN); ca. 1 km a E del Caserio de Guarinuma, 23 Feb. 1979, *Huber 3356* (VEN); Cerro Yapacana, 28 Feb. 1980, *Huber 4815, 4829* (US, VEN); Dept. Casiquiare, 2–3 km al SE del bajo Guasacavi, 10 Mar. 1980, *Huber 5114* (US, VEN).

This species is distinguished by a combination of flattened, prominently thick-edged and ciliate leaves; ancipital and ciliate scapes; and hooded-tipped and reddish-margined, ciliate bracts. The margins of the leaf sheath, while thin, are firm and terminate in a long, narrow, sharp ligule. The large pale dorsal areas and surfaces of leaf blades and scapes are all strongly punctate.

21. Xyris graniticola Kral, sp. nov. TYPE: Venezuela: Amazonas. Dept. Atures, vegetación de laja (VL) sobre afloramiento granítico en raudal "pereza" en el Río Autana, 9 Nov. 1984, *F. Guánchez & E. Melgueiro 3425* (holotype, VEN; isotypes, TFAV, VDB). Figure 21.

Planta perennis, densicaespitosa, glabra; radices graciles. Caules breves vel usque ad 3 cm longis. Folia principalia erecta vel leviter flabellate expansa, 10–25 cm longa, scapos circa aequantes, vaginis scaporum longiora; vaginae integrae, carinatae, nitidae, pallide brunneolae, laminis 1–2-plo breviores, ad basin gradatim dilatatae, in laminas gradatim decrescentes, ad apicem ligulatae, ligula rigida, erecta, linearotriangulata, usque ad 1.5 mm longa; laminae anguste lineares, tortae, leviter complanatae, 0.5–0.7 mm latae, longitudine inconspicue paucinervatae, margine ad basin truncato-incrassatae, hispidulae, ferrugineae; apices peranguste conicae, ad apicem dorsaliter scabridae. Vaginae scaporum prope basin brunneolae, nitidae, apicem versus apertae, laminis brevis. Scapi leviter torti, teretes, vel in sectio transversali elliptici, ca. 0.5 mm lati, ecostati, olivacei. Spicae pauciflorae, anguste vel late turbinatae, ca. 4–5 mm longae; bracteae leviter expansae, integrae, decussatae, infimae 4 steriles, par inferiora lanceolata, ca. 4 mm longa, carinata, area dorsali lineari, par intima late triangulata, ca. 3.5 mm longa, area dorsali triangulata, leviter nervata; bracteae fertiles oblongae, 4–4.5 mm longae, anguste obtusae, subconduplicatae, anguste rotundatae, inconspicue unicostatae, dorsum ad basin castaneo, ad apicem area dorsali ovata, viridi. Sepala lateralia libera, aequilateralia, ca. 4 mm longa, obtusa, leviter curvata, ala carinali angusta, integra vel remote papillosa. Laminae petalorum obtriangulatae, luteolae, ca. 2–2.5 mm longae, apice subtruncatae, irregulariter dentatae. Staminodia bibrachiata, brachiis lon-

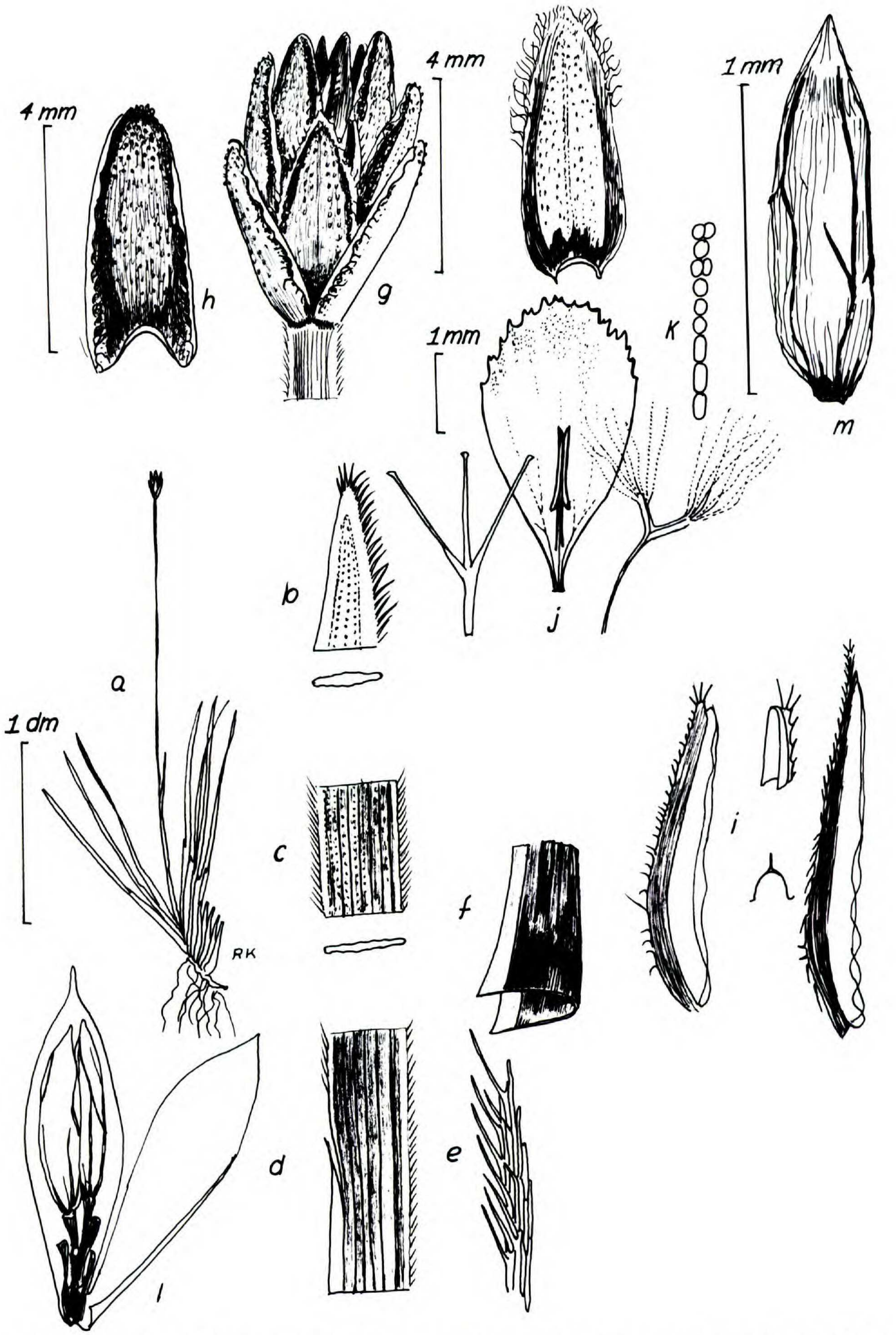


FIGURE 20. Xyris huberi (Huber 4815).—*a. Habit sketch.—b. Leaf apex.—c. Sector of leaf midblade.—d. Leaf–sheath junction.—e. Trichomes of leaf blade margin, enlarged.—f. Leaf base.—g. Spike.—h. Fertile bracts (left and right of spike).—i. Lateral sepals (extremes at left and right).—j. Petal blade and stamen; stylar apex on left, staminode on right.—k. Enlarged tip of beard hair.—l. Capsule, one valve removed, showing basal-central placentation.—m. Seed.*

gipenicillatis. Antherae oblongae, profunde bifidae et sagittatae, ca. 1 mm longae, filiis ca. 0.5 mm longis. Capsula matura ca. 3 mm longa, obovoidea; placenta basalis. Semina ovoidea, ca. 0.5 mm longa, translucentia, atroferruginea vel fusca, subtiliter longitudine multicostata.

The plant perennial, densely cespitose, smooth; the roots slender-fibrous. Stems short or up to 3 cm long. Principal leaves erect to slightly flabellately spreading, 10–25 cm long, about as long as the scapes, longer than the scape sheaths; sheaths entire, carinate, shining, pale brown, ½ or more the length of the blades, gradually dilated toward base, gradually narrowing into the blades, ligulate at apex, the ligule erect, rigid, linear-triangular, up to 1.5 mm long; blades narrowly linear, twisted, somewhat flattened, 0.5–0.7 mm wide, inconspicuously few-nerved, the margin toward the base beveled-incrassate, reddish, hispidulous; tips narrowly conic, dorsally scabrid at apex. Scape sheaths brownish toward base, shining, open, short-bladed toward apex. Scapes somewhat twisted, terete or elliptic in cross section, ca. 0.5 mm wide, ecostate, olivaceous. Spikes few-flowered, narrowly to broadly turbinate, ca. 4–5 mm long; bracts slightly spreading, entire, decussate, with conspicuous dorsal areas, the lowest 4 sterile, the lowermost pair lanceolate, ca. 4 mm long, carinate, the dorsal area linear, the inner pair broadly triangular, ca. 3.5 mm long, the dorsal area triangular, lightly nervose; fertile bracts oblong, 4–4.5 mm long, narrowly obtuse, subconduplicate, narrowly rounded, inconspicuously unicostate, the back castaneous toward base, with an ovate green dorsal area toward apex. Lateral sepals free, equilateral, ca. 4 mm long, oblong, obtuse, slightly curvate, the keel narrow, entire to remotely papillate. Petal blades obtriangular, yellow, ca. 2–2.5 mm long, the apex subtruncate, irregularly dentate. Staminodes bibrachiate, the branches long-penicillate. Anthers oblong, deeply bifid and sagittate, ca. 1 mm long, on filaments ca. 0.5 mm long. Mature capsule obovoid, ca. 3 mm long, the placenta basal. Seeds ovoid or ellipsoid, ca. 0.5 mm long, translucent, deep reddish brown or brown, finely longitudinally many-lined.

Distribution. A "laja" plant known only from the type locality.

This species comes, in treatments of Venezuelan *Xyris*, nearest those perennials with discernably leafy stems, distinct dorsal areas, and comparatively low stature, such as *X. frondosa* Mag. & Sm. However, the few-flowered spikes, in their turbinate outline and broad dorsal areas, are strikingly similar to those of *X. guianensis* Steud., here differing primarily in the nearly entire-keeled, less curvate lateral sepal. The latter plant is also shorter-stemmed, its leaves wiry-bordered.

22. Xyris frondosa Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 33, fig. 18A–E. 1963. TYPE: Venezuela. Bolívar: frequent in scrub forest near Summit Camp, 1,925 m, Central Section, Chimantá Massif, 2 Feb. 1955, *J. A. Steyermark & J. J. Wurdack 346* (holotype, NY; isotypes, F, US, VEN). Figure 22.

Moderately low, slender, densely cespitose perennial 2–3 dm high, the stems ascending, elongate, and forming frondlike plates of leaves. Leaves flabellately spreading, mostly 15–20 cm long; sheaths firm, entire, up to ½ as long as blades, deep reddish brown, papillate, tapering evenly to blade, often ciliate-carinate, at blade junction with an erect, narrowly triangular ligule to 1 mm long or eligulate; blades flat, often twisted, linear, 1.5–2.5 mm wide, tapering evenly to an acute-incurved, densely pale-ciliate apex, the margins ascending-ciliate with pale narrow hairs, submarginally with a deep reddish brown border, the surfaces green or maroon, finely multinerved, mostly smooth. Scape sheaths shorter than leaves, loosely carinate, keel ciliate, open at apex, short-bladed. Scapes slenderly linear, straight or slightly flexuous, slightly twisted, distally terete or slightly compressed, ecostate or low-bicostate, smooth. Spikes ellipsoid, 6–7 mm long, reddish brown, several-flowered, the bracts tightly spirally imbricate and with distinct reddish brown dorsal areas,

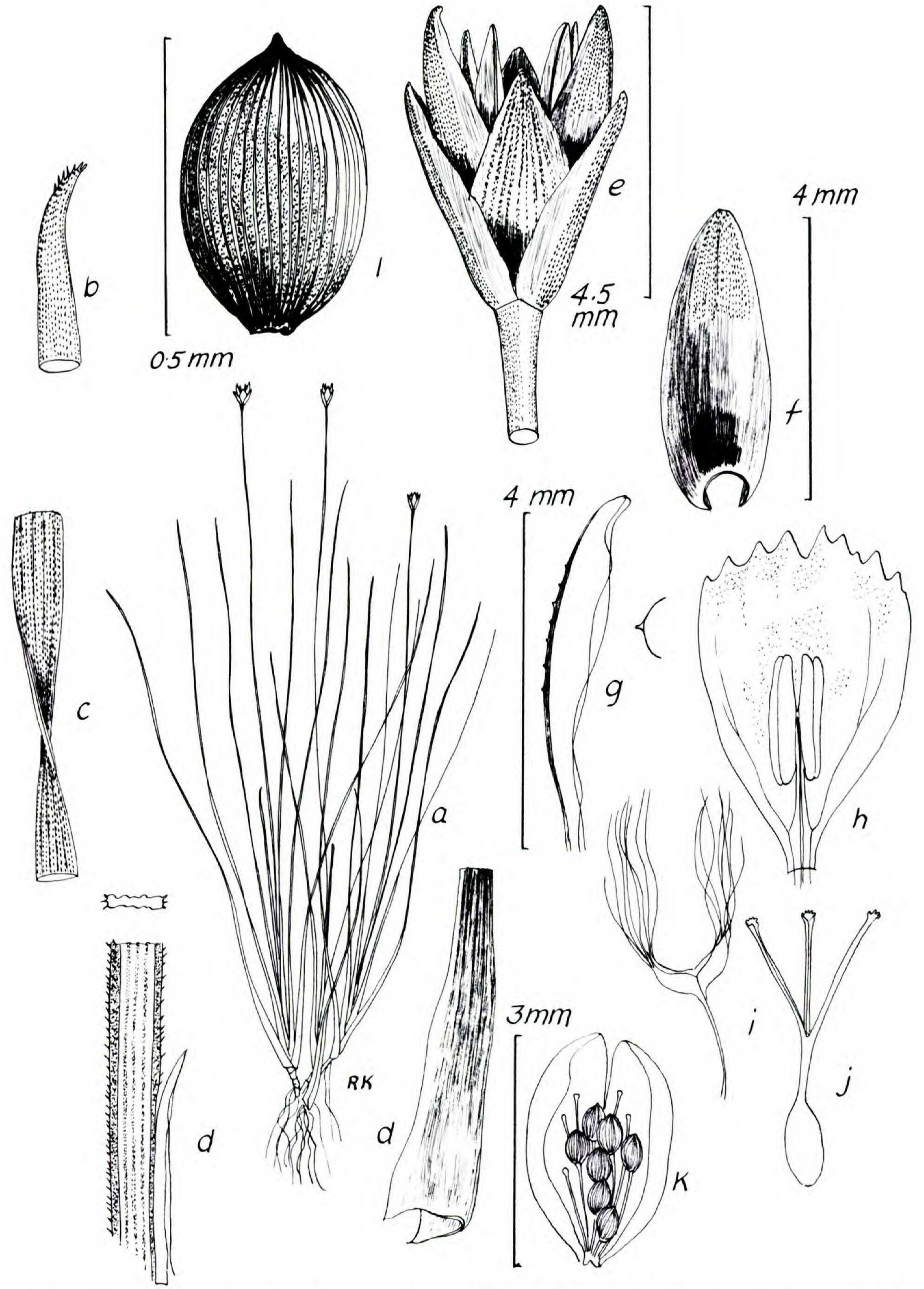


FIGURE 21. Xyris graniticola *(from the isotype)*.—*a. Habit sketch.*—*b. Leaf apex.*—*c. Sector of midblade.*—*d. Leaf sheath–blade junction (at left); leaf base (at right).*—*e. Spike.*—*f. Fertile bract.*—*g. Lateral sepal.*—*h. Petal blade, stamen.*—*i. Staminode.*—*j. Ovary, style branches.*—*k. Capsule, one valve removed.*—*l. Seed.*

apically often white-villosulous-ciliate; sterile bracts smallest, grading into the fertile bracts, triangular or ovate, acute, keeled, the fertile bracts obovate, ecarinate, 4.5–5 mm long, subentire, broadly rounded apically, backs convexly rounded, the dorsal areas bisected by a low but distinct rib. Lateral sepals oblong, curvate, free, inequilateral, ca. 4.5 mm long,

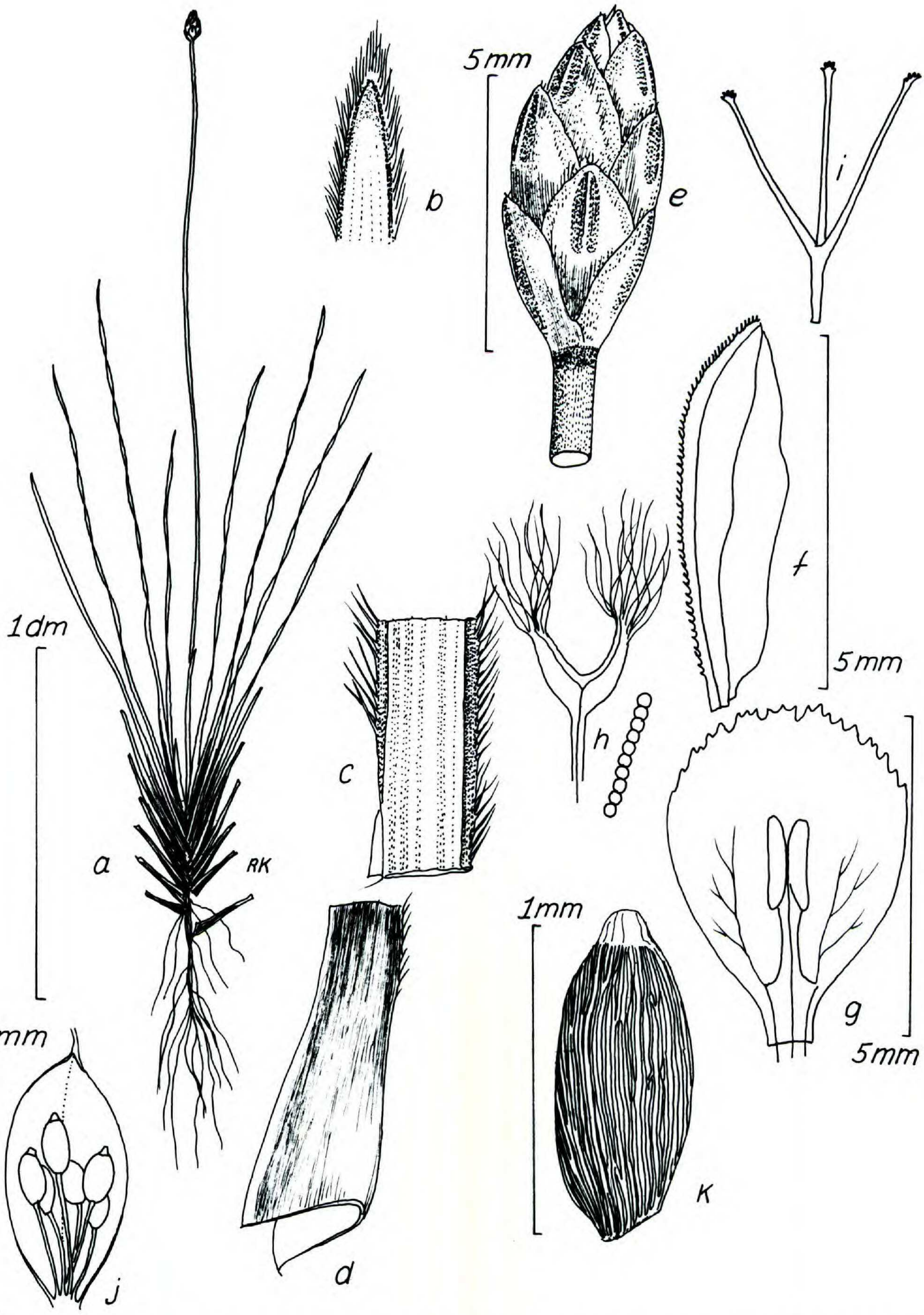


FIGURE 22. Xyris frondosa *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule, one valve removed, showing basal placentation.—k. Seed.*

blunt, pale reddish brown with a dark, firm, irregularly tuberculate-ciliate or ciliolate keel from base to apex. Petal blades broadly obovate to suborbicular, yellow, ca. 5 mm long, the apical margin lacerate-dentate. Staminodia bibrachiate, the broad, flat branches densely penicillate at tip. Anthers oblong, ca. 1 mm long, bifid, auriculate, on flattened fil-

aments ca. 1 mm long. Capsule ellipsoid or narrowly obovoid, ca. 3 mm long, the placentation basal, the valves without evident septa. Seeds several, on long funiculi, ellipsoid to oblong-cylindrical, ca. 1 mm long, translucently deep amber, pale apiculate, with fine, longitudinal, anastomosing ribs.

Distribution. Abundant in wet, high savanna, the Chimantá Massif and associated systems, usually above 1,500 meters, Estado Bolívar, Venezuela.

Additional collections examined (since those published by Maguire & Smith (1963)). VENEZUELA. BOLÍVAR: Macizo del Chimantá, *Huber & Steyermark 6907* (VDB, VEN); Chimantá, Apacará-tepui, *Huber & Steyermark 6961* (VDB, VEN); sección oriental del Chimantá-tepui, *Huber & Steyermark 7161* (VDB, VEN); Auyan-tepui, *Huber & Medina 8538* (NY, VEN); Apacará-tepui, *Huber & Colella 8727* (NY), *8736*, *8774* (NY, VDB, VEN); Churi-tepui, *Huber & Colella 9000* (NY, VDB, VEN); Acopan tepui, *Huber et al. 9069* (NY); ca. 25 km al SE de Canaima, *Huber 9730* (MYF, VDB); Murey-tepui, *Huber 11586* (MYF, VDB, VEN); Abacapá tepui, *Huber 11471* (MYF, VDB, VEN); Meseta de Jaua, Cerro Jaua, *Steyermark 98124* (MO, NY, VEN); Auyan-tepui, *Steyermark 93505* (NY, US, VEN), *93697* (F, NY, US, VEN), *93757* (NY, US, VDB, VEN), *93992* (L, NY, US, VEN); Cerro Jaua, *Steyermark 98055* (F, VEN), *109387* (NY, VEN); Cerro Guanacoco, *Steyermark et al. 109731* (US, VEN), *109734* (US, VEN); Cerro Jaua, *Steyermark 109426* (US, VDB, VEN), *109460* (K, MO, US, VEN), *109610* (US, VDB, VEN); Cerro Guaiquinima, *Steyermark & Dunsterville 113173* (F, US); Murey (Eruoda) tepui, *Steyermark et al. 115839* (F, MO, US, VEN).

This low-growing species with its long-stemmed fronds of rusty-bordered, ciliate leaves and small spikes with distinct dorsal areas, has no near morphological neighbor within its narrow range.

23. Xyris chimantae Kral & Lyman B. Smith, Phytologia 53: 432–433, fig. 1a–h. 1983. TYPE: Venezuela. Bolívar: Chimantá Massif, central section, swampy depression in wet savanna along east branch of headwaters of Río Tirica, 2,120 m, 12 Feb. 1955, *J. A. Steyermark & J. J. Wurdack 768* (holotype, VEN; isotypes, F, NY). Figure 23.

Cespitose perennial to 6 dm high, the stems either short or ascending through deep substrate and to 1 dm long, the bases mostly covered by scalelike old leaf bases. Roots slender, arising from lowermost nodes. Principal leaves stiff, spreading distichously, (1.8–)2–4(–4.8) dm long, longer than scape sheaths; blades narrowly linear, 3–4 times longer than the sheaths, slightly twisted, flattened, somewhat thickened and with thick margins, 2–2.5 mm wide, olivaceous to yellow-brown, finely papillose-rugulose; apices abruptly incurved-acute, thickened, entire to scabrociliate; margins slightly papillose to minutely scabro-ciliate; sheaths ecarinate, the broad bases firm, lustrous, castaneous to yellow-brown, entire, narrowing gradually into blades, eligulate. Scape sheaths proximally tubular, dark, multicostate, papillose, distally open, short-bladed. Scapes slenderly lineal, straight or slightly flexuous, slightly twisted, distally subterete to oval or elliptic in cross section, ecostate to narrowly bicostate, the costae papillose to scabrid. Spikes obovoid to obconic, ca. 1 cm long, many-flowered, the bracts loosely imbricate, subdecussate, ecarinate, without dorsal area, smooth, light to deep brown, strongly lacerate; sterile bracts several, ovate, shorter than the fertile bracts and grading into them; fertile bracts several, ovate, 7 mm long, narrowly rounded, reddish ciliate at apex when young, with the median nerve low but manifest. Lateral sepals free, subequilateral, oblanceolate, ca. 5.5 mm long, included to exserted at apex of spike, slightly curvate, acute; keel reddish fimbriociliate from middle to tip. Petal blades obovate-rhombic, ca. 6 mm long, yellow, apically narrowly rounded, erose. Staminodia bibrachiate, the branches long-penicillate. Anthers narrowly oblong, ca. 2 mm long, shallowly bifid, shallowly auriculate, on filaments ca. 1 mm long. Capsule cylindric-ellipsoid, ca. 5 mm long, the valves with septa from base to tip. Seeds narrowly ellipsoid-fusiform, ca. 2 mm long, including a terminal white, conic scale 0.6–0.7 mm long, the seed body reddish brown, translucent, conspicuously longitudinally multiribbed.

Distribution. Locally abundant in wet savanna at elevations over 1,900 meters, the

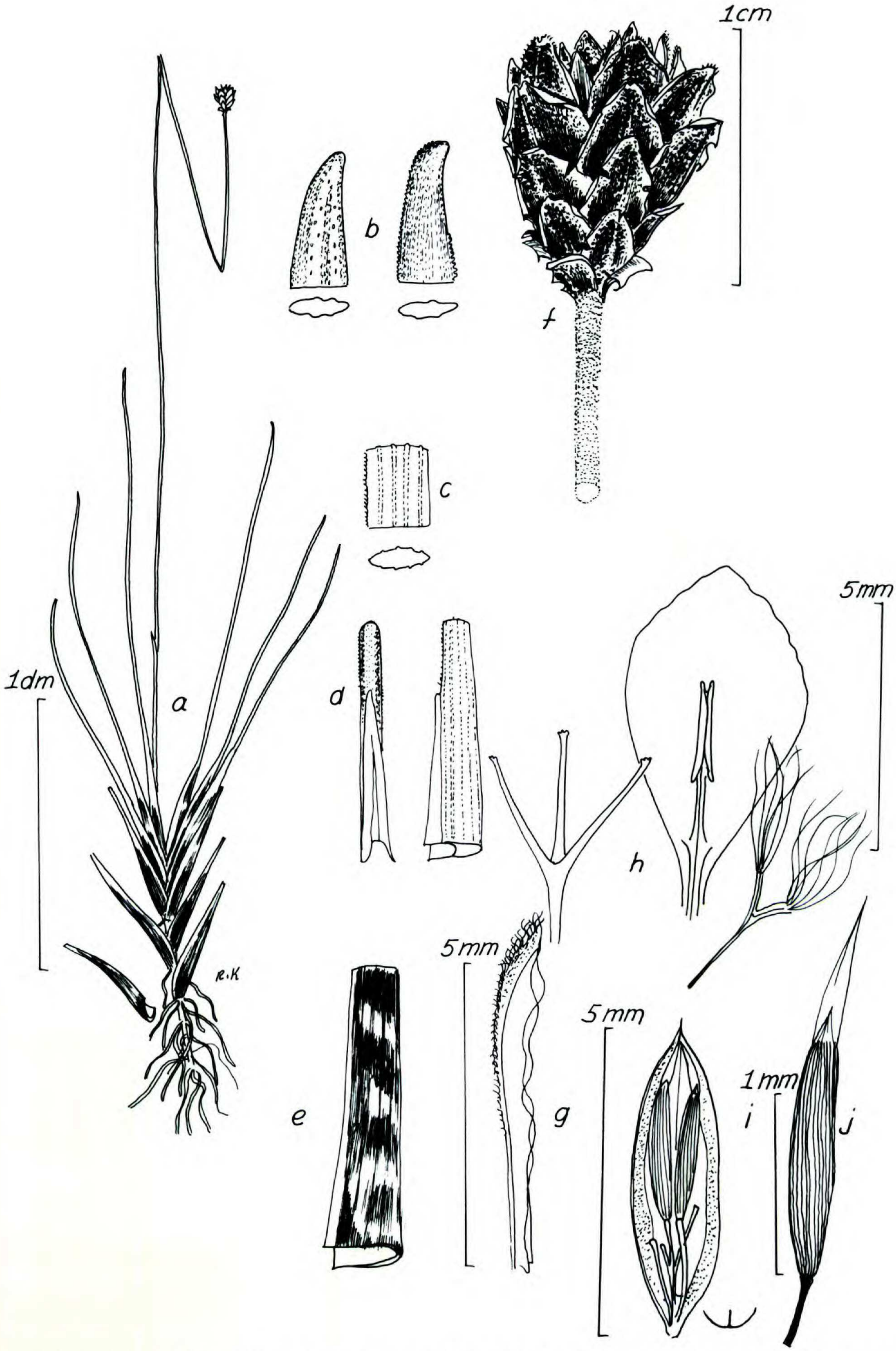


FIGURE 23. Xyris chimantae *(from the type)*.—*a. Habit sketch.—b. Two leaf tips.—c. Leaf blade, sector at midblade.—d. Two views of leaf sheath–blade junction.—e. Leaf base.—f. Spike and upper scape.—g. Lateral sepal.—h. Petal blade, stamen, staminode, stylar apex.—i. Capsule, showing side views of two septa (stippled).—j. Seed.*

Chimantá Massif in Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: *Huber & Dezzeo 8592* (NY); *Huber & Colella 8735* (NY, VDB, VEN); *Huber et al. 10181* (MYF, VDB); *Steyermark & Wurdack 486* (F, NY, US, VEN); *Steyermark & Wurdack 1010* (F, NY, VEN); *Steyermark 75870* (F, NY, VEN); *Steyermark et al. 115835* (US, VEN); *Steyermark et al. 115922* (MO, US, VDB); *Steyermark et al. 128375 & 128380* (VDB, VEN).

This species is most similar to *X. lugubris* Malme but is overall more slender and has spikes of narrower outline and longer seeds.

24. Xyris stenophylloides Malme, Bull. Torrey Bot. Club 58: 323. 1931. TYPE: Venezuela. T. F. Amazonas: gorge of Caño Negro, Savanna Hills, growing in tussocks, Cerro Duida, 4,000 ft., *G. H. H. Tate 808* (lectotype, NY; paratype, "Savanna Hills, summit of Cerro Duida, 2 Sept. 1944, *Steyermark 58211*," F, NY, US, VEN). Figure 24.

Slender, densely cespitose, hard-based, smooth perennial 3–4 dm high, the stems contracted. Leaves erect or ascending, to 2.5 dm long; sheaths entire, much less than ½ as long as blades, the bases lustrous pale brown shading upward through yellow-brown to green, tapering from a slightly dilated base gradually to blade, there abruptly narrowed and producing an oblong, rounded or acute ligule to 1 mm long; blades narrowly linear, pale green, proximally and medially somewhat flattened, ca. 1 mm wide, narrowing gradually above middle to a narrowed, bluntly conic or flattened, thickened apex, the margins thick and rounded, smooth, the surfaces green, strongly 1–2-nerved, sometimes sulcate. Scape sheaths shorter than leaves, proximally tubular, striate, lustrous brown at base, open toward apex, there producing a short, erect, cusplike blade. Scapes straight or flexuous, twisted, distally subterete, 0.5–0.7 mm thick, with broad, low costae and shallowly sulcate, striate. Spikes broadly turbinate, 7–8 mm high, red-brown, of several loosely subdecussate bracts without dorsal areas, the sterile ones several, the lowest much smaller, ovate, narrowly rounded, slightly convex-carinate, grading gradually to fertile bracts, these oblong, 5.5–6 mm long, apically truncate or broadly rounded, erose or lacerate, ecarinate, slightly folded, low-papillose. Lateral sepals free, equilateral, elliptic-linear, broadly acute, ca. 5 mm long, tan, the firm narrow keel entire. Petal blades broadly obovate, ca. 4 mm long, the broadly rounded apex erose. Staminodia bibrachiate, the slender branches long-penicillate-pubescent. Anthers lance-oblong, ca. 1.5 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsule obovoid, ca. 3 mm long, the central axis extending ⅔ the fruit length, the placentation appearing axile at least at fruit base, the valves with broad, thin septa. Mature seeds fusiform, ca. 1.5 mm long, pale brown, translucent, longitudinally multiribbed.

Distribution. Known only from the Cerro Duida area in rocky "open" seeps above 1,000 meters, very seldom collected, the only records other than types being the following.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Jan.–Feb. 1969, *M. Farinas, J. Velasquez & E. Medina 406* (NY, VEN); vertiente norte del Tepuy Duida, 16 Nov. 1982, *F. Guanchez 2342* (TFAV, VDB, VEN); between Brocchinia Hills and Savanna Hills, 1,050–1,600 m, 2 Sep. 1944, *Steyermark 58211* (F, NY, US, VEN); topotype, *S. S. Tillett et al. 751-67* (MYF, VEN).

This species is in several characters closest to *X. scabridula* Steyerm. from the same massif; however, *X. scabridula* is harsher in foliage, has the leaves more thickened, and the lateral sepals broader and ciliate.

25. Xyris columbiana Malme, Ark. Bot. 13(3): 40. 1913. TYPE: Venezuela. Merida: "Jaji" (fide L. B. Smith, Caldesia 6(29): 22. 1954). The original label information is "*Xyris tortilis* Kl. Columbian. Moritz," the location given as "Taji," and was therefore interpreted by Malme as in Colombia (*Moritz 1202*, Herb. Berol. & *415*, BM; isolectotype, L). I have seen only the isolectotype and must also assume that the original material at B is lost, while that at BM remains to be designated lectotype. Figure 25.

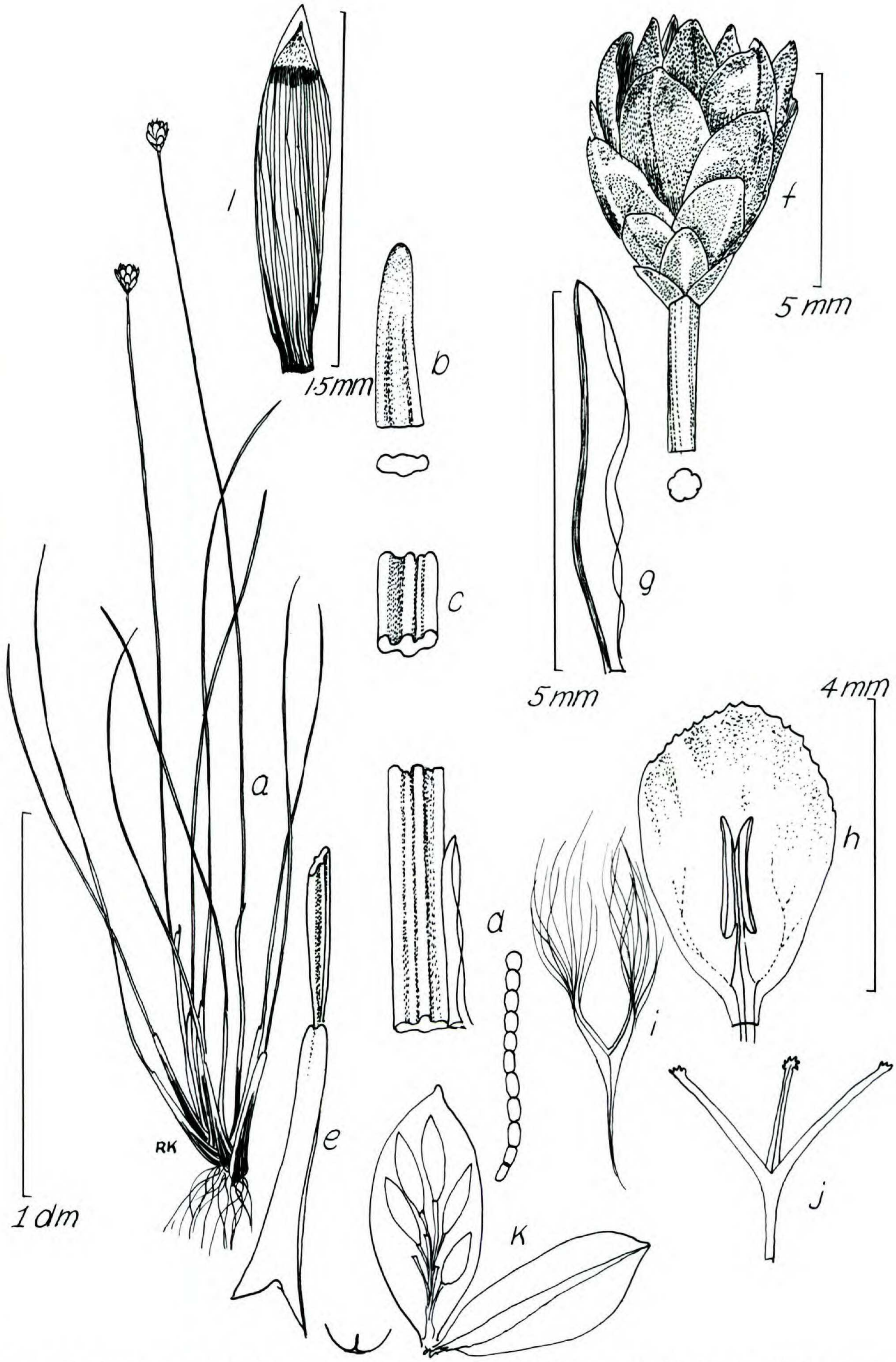


FIGURE 24. Xyris stenophylloides (Tate 808, Steyermark 58211).—*a. Habit sketch.—b. Leaf apex.—c. Sector from midblade.—d. Leaf at junction of sheath and blade.—e. Leaf base, inside view, showing orientation of blade base.—f. Spike and upper portion of scape.—g. Lateral sepal.—h. Petal blade.—i. Staminode.—j. Stylar apex.—k. Opened capsule showing two valves, placentation.—l. Seed.*

Cespitose, soft-based perennial to 6 dm high, the stems short. Leaves erect or ascending, mostly 2–3 dm long; sheaths entire, less than ½ as long as blades, narrowing gradually from the somewhat dilated, reddish green base to the blade, there producing a broadly oblong ligule 1–2 mm long; blades narrowly ensiform-linear, 0.5–1.5 mm wide, slightly twisted, flattened but round-edged, the apex narrowly acute, conic, the surfaces variously papillose-rugulose, dull green. Scape sheaths shorter than foliage leaves, the bases tubular, multicostate, the open apex producing a short, erect blade. Scapes straight or somewhat flexuous, narrowly lineal, terete or subterete distally, ca. 1 mm thick, unicostate, the costa low but strong, smooth or papillate. Spikes broadly obovoid to broadly ellipsoid or subglobose, 7–9 mm long, of several spirally imbricate, thin, castaneous bracts without dorsal areas, the sterile ones mostly 4–6, the lowest pair strongly keeled, ovate-triangular, 3.5–4 mm long, the inner slightly longer and broader, grading into the fertile bracts, these broadly obovate, ca. 5 mm long, broadly rounded apically, entire-margined, the backs slightly convex, ecarinate. Lateral sepals free, inequilateral, 5–6 mm long, strongly curvate, oblanceolate, pale brown with deep brown, firm keels, these ciliolate to villosulous-ciliate from ca. middle to apex. Petal blades ca. 6 mm long, elliptic, the broadly acute apex erose. Staminodia bibrachiate, the branches densely long-penicillate. Anthers oblong, ca. 2 mm long, the apex deeply bifid, the base sagittate, on filaments ca. 1 mm long. Capsule ellipsoid, 4–5 mm long; placentation free-central, the axis tending to separate into 3 branches distally, the ovules very numerous. Seeds ellipsoid, ca. 0.7 mm long, translucent, finely ribbed longitudinally.

Distribution. Andean paramos, apparently rare, Colombia and Venezuela.

Additional specimens examined. COLOMBIA. BOYACA: saturated sphagnum overlying sand, La Cumbre, valley of Río Pomera, 8,000 ft., 20 Aug. 1944, *N. C. Fassett 25631* (US); Cordillera Oriental, al NE de Arcabuco, linea divioria entre Boyaca y Santander del Sur, 2,600 m, 7 May 1972, *H. García-Barriga & R. Jaramillo M. 20267* (GH). ANTIOQUIA: a 1 km al sur de Hoyo Rico, ca. 2,600 m, 26 Sep. 1948, *F. A. Barkley 18A. 150* (US). VENEZUELA. MERIDA: Hoya del Río Capaz, bosque de San Eusebio: La Pinuela, bosque y pantamo, 2,600 m, 22 Oct. 1969, *J. Cuatrecasas et al. 28152* (US).

This has definite affinities with *X. subulata* Ruíz Lopez & Pavón but differs in having somewhat larger habit, larger, broader spikes which produce more florets, and more conspicuous indumentum of the lateral sepal keels.

26. Xyris subulata Ruíz Lopez & Pavón, Fl. Peruv. I: 46, pl. 71. 1798. TYPE: Peru. Huanuco: Pachitea, Pillao, 1787, *Ruíz Lopez & Pavón* (lectotype, MA; isolectotype, presumably at F).

Schizmaxon distichioides Steud., Bot. Zeitung (Berlin) 14: 391. 1856.

Densely cespitose, dwarf or to 5 dm high, the stems abbreviated to quite elongate and frondlike, to 1 dm long, the leaves erect to spreading flabellately, shorter than scapes or surpassing them, the sheaths entire or ciliate, mostly firm and lustrous, equaling blades in length or less than ½ as long, the blades mostly narrowly linear, the tips incurved-acute to blunt, the margins thin or incrassate, entire to papillate-scabrid or ciliolate, the surfaces usually dark green, smooth to (toward base) papillose-rugulose. Scape sheaths tubular proximally, open and carinate distally, the blades short to much elongated as in leaves. Scapes straight or flexuous, twisted, narrowly lineal to filiform, terete to somewhat compressed toward apex, ecostate to bicostate, smooth or papillate or ciliolate-scabrid along costae. Spikes mostly narrowly oblong to ovoid, mostly blunt, 0.5–1 cm long, the bracts decussate, thin, carinate to ecarinate, entire, deep olive brown, reddish brown or (mostly) near black, the sterile bracts usually 4, the lowest pair keeled, ca. ½ length of spike or less, the inner pair broader, slightly longer and ecostate, the fertile bracts mostly 2–4, broadly ovate, apically narrowly or broadly rounded, the backs papillose to smooth, folded-rounded. Lateral sepals mostly oblong-linear, free, subequilateral, mostly navicular, 3.5–6 mm long, narrowly to broadly acute,

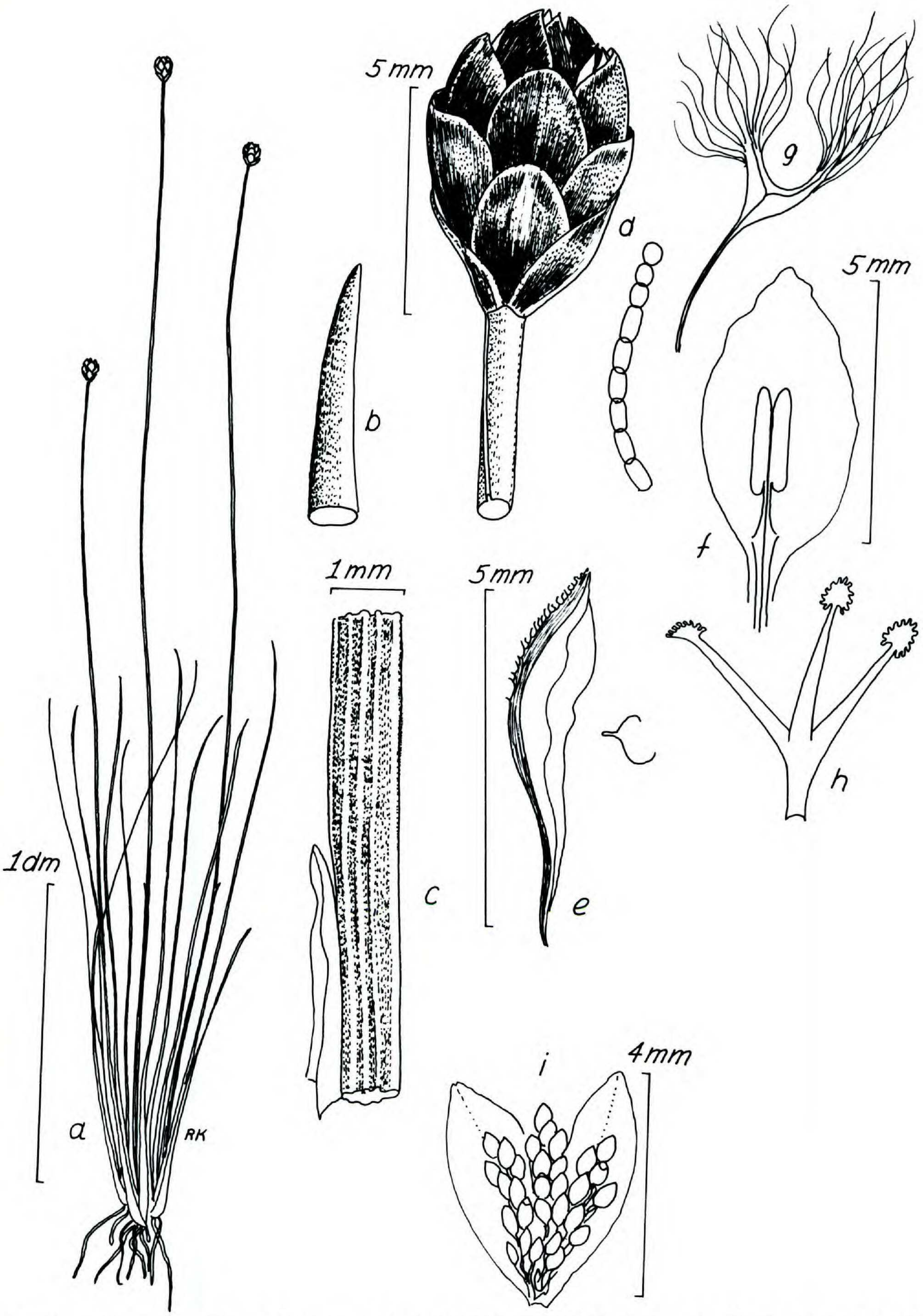


FIGURE 25. Xyris columbiana *(*Cuatrecasas et al. 28152*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade at junction with sheath.—d. Spike.—e. Lateral sepal.—f. Petal blade, stamen.—g. Staminode, enlarged sector of beard hair.—h. Stylar apex.—i. Capsule, one valve removed.*

with or without keel, entire to ciliolate or papillate along the crest or back medially. Petal blades broadly ovate to nearly orbicular, yellow, 3.5–5 mm long the broadly rounded apex erose or entire. Staminodia bibrachiate, branches long-penicillate. Anthers oblong, 0.6–2 mm long, the connective broad, on filaments 1–2 mm long. Capsule firm-valved, ellipsoid, 2–4 mm long, the placentation basal-central, the funicles elongate, the valves without septa or producing these at very base. Seeds ovoid to fusiform-cylindric, 0.5–1 mm long, prominently longitudinally ribbed or alveolate-reticulate.

This species has at least five marked varieties, the complex ranging widely along the "young" western cordilleras, from Costa Rica south to Chile, always in the high, cool to cold, "páramo." Only two of the varieties are known definitely to occur in the area of this treatment, but the key below includes the type variety which may yet be found there.

KEY TO SUBSPECIES OF *XYRIS SUBULATA*

1a. Edges of leaf sheaths variously ciliate; stems usually elongate.
  2a. The plants with leaves much shorter than scapes; seeds ca. 1 mm long; lateral sepals ca. 5 mm long ..... 26A. *X. subulata* var. *subulata*
  2b. The plants dwarf, with leaves mostly equaling or exceeding scapes; seeds ca. 0.5 mm long; lateral sepals 3.5–4 mm long ..... 26B. *X. subulata* var. *breviscapa*
1b. Edges of leaf sheaths entire; stems mostly contracted ..... 26C. *X. subulata* var. *acutifolia*

26A. **Xyris subulata** Ruíz Lopez & Pavón var. **subulata.** Figure 26A.

Plants 10–30 cm high, the stems often elongate, with overlapping leaves forming fronds. Leaves flabellately ascending, loosely imbricate, ⅓–⅔ as long as scapes, the lustrous, pale red-brown sheaths ½ as long as the darker blades or longer, spreading arachnoid-ciliate, tapering gradually from the broad, clasping bases into blades, eligulate, the blades narrowly linear to filiform, mostly 0.5–1 mm wide, pale to deep green or red-green, compressed, flat to somewhat thickened, often terete toward apex, the tips terete, narrowly conic but blunt, the ventral edge a broad, papillose-rugulose band, the dorsal edge smooth or papillose, the surfaces papillose or smooth. Scape sheaths shorter than or slightly overtopping principal leaves, with strong, incurved-tipped blades similar to leaves. Scapes filiform, straight or flexuous, slightly twisted, terete below, subterete toward apex, or slightly compressed and bicostate, 0.3–0.5 mm wide, the surfaces mostly olive, smooth or (more often) tuberculate-papillose at least on costae. Spikes mostly ovoid to lance-ovoid, 2–4-flowered, 5–7 mm long, pale brown to near black, the bracts thin, loosely imbricate, decussate, entire or erose, without dorsal areas, the sterile pairs 2, the lowest pair shortest, ovate, carinate, the inner pair mostly broader, slightly longer, less carinate, the lowest pair of fertile bracts ecarinate but folded, much longer than the sterile bracts, ca. 4–5 mm long, entire, aging lacerate, dull or lustrous. Lateral sepals free, very thin, subequilateral, ca. 5 mm long, navicular, the midzone nearly without keel, entire. Petal blades broadly obovate to nearly suborbicular, ca. 5 mm long, yellow, broadly rounded, subentire. Anthers ca. 1 mm long, oblong, deeply bifid at apex, the filaments ca. 1.5 mm long. Staminodia bibrachiate, the flattened, narrow branches elongate, long-penicillate. Capsule firm-valved, brown, ellipsoid, ca. 3 mm long, placentation basal, funiculi elongate. Seeds fusiform-cylindric, ca. 1 mm long, caudate, red-brown, translucent, longitudinally irregularly multiribbed.

Distribution. South America, Andean paramos, rare in Colombia, increasingly frequent, Ecuador south through Peru. For Colombia I have only one certain record.

Additional specimen examined. COLOMBIA. ANTIOQUIA: Páramo Frontino Cerro de Campanas, *Espeletia* paramo, 3,650–4,290 m, clumps of ca. 20 plants, 28 Oct. 1976, *J. D. Boeke & J. B. McElroy 287* (U).

The long "stems" of this and related taxa may in part be a result of the deep humus deposits in which dense clumps of this sort of

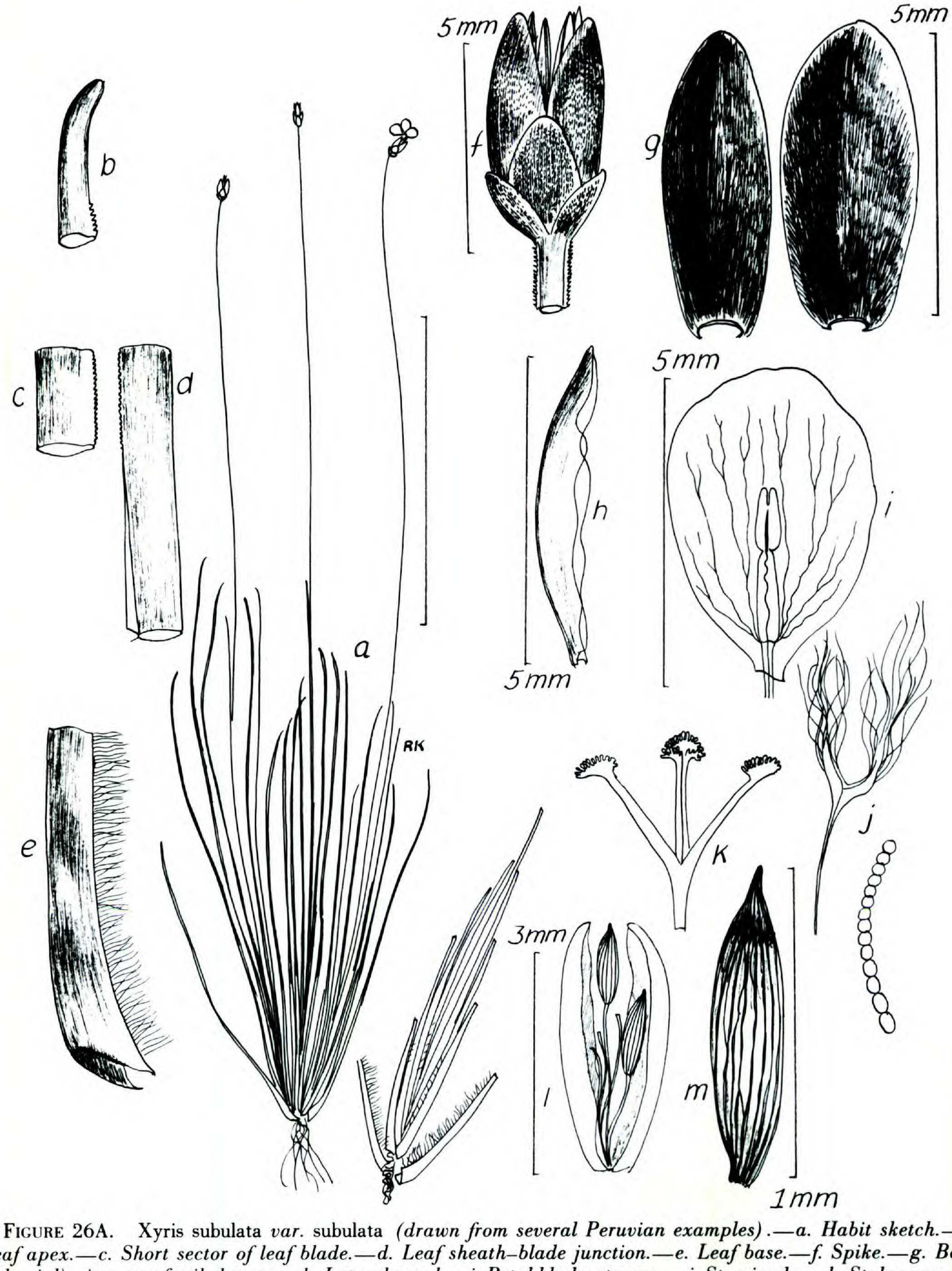


FIGURE 26A. Xyris subulata *var.* subulata *(drawn from several Peruvian examples).—a. Habit sketch.—b. Leaf apex.—c. Short sector of leaf blade.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike.—g. Back (abaxial) view, two fertile bracts.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode.—k. Stylar apex.—l. Capsule.—m. Seed.*

plant are rooted, this "burying" resulting in significant elongation of internodes comparable to that in *X. witsenioides* Oliv. and related species.

26B. Xyris subulata var. **breviscapa** Idrobo & Lyman B. Smith, Caldasia 6: 220, fig. 16. 1954. TYPE: Colombia. Putumayo: alta cuenca del Río Putumayo,

filo de la Cordillera entre El Encano y Sibundoy, paramo de San Antonio de Bordencillo, 3,250 m, 4 Jan. 1941, *J. Cuatrecasas 11744* (holotype, US; isotype, COL). Figure 26B.

Densely cespitose perennial, tufted as in moss, to 1 dm high, usually much lower, the stems ascending from fascicled rhizomes, forming frondlike plates of leaves and leaf bases. Leaves 2.5–10 cm long, loosely imbricate, ascending-flabellate, the sheaths as long as blades or slightly longer, lustrous pale brown, smooth-keeled, low-costate, tapering gradually from broad, clasping bases into the blades, eligulate, the blades filiform to narrowly linear, flattened, ca. 0.5 mm wide, the apex subterete, slender-incurved, smooth, the ventral margin slightly thickened, pale, papillose-rugulose, the surface olive, with a few low nerves, usually smooth. Scape sheaths slightly longer than or slightly shorter than principal leaves, with elongate, incurved blades as in leaves. Scapes to 1 dm high, overtopping leaves or overtopped by leaves, filiform, 0.3–0.4 mm thick distally, there terete or slightly flattened, usually bicostate, the costae scabridulous, the surfaces olivaceous, usually papillate. Spikes narrowly to broadly ovoid, pale brown to dark brown, 4–7 mm long, the bracts decussately arranged, loosely imbricate, thin, the sterile of 2 pairs, the lowest pair broadly ovate-triangular, keeled, ca. 2 mm long, the inner pair ovate, carinate only toward the apex, ca. 3 mm long, the fertile bracts 2(–4), oblong-ovate, 3.5–4 mm long, the apex entire or erose, scarious, folded or carinate. Lateral sepals free, subequilateral, oblong, 3.5–4 mm long, the apex obtuse, nearly without keel, this a darker thickening medially, entire. Petal blades broadly elliptic to broadly obovate, yellow, 3.5–4 mm long, subentire, apiculate, erose. Anthers oblong, 0.6–0.7 mm long, deeply bifid, on filaments ca. 1 mm long. Staminodia bibrachiate, long-penicillate. Capsule broadly ellipsoid or obovoid, brown, ca. 2 mm long, the placentation basal, the funiculi elongate. Seeds ca. 0.5 mm long, ovoid, short-apiculate, rather coarsely ridged and cross-ridged, this irregularly reticulate.

Distribution. High grassy paramos of the Andes, Colombia south into Peru and Bolivia.

Additional specimens examined. BOLIVIA: Cordillera Real, Cocopunco, 10,000 ft., 24–29 Mar. 1926, *G. H. H. Tate 321* (NY); Tolapampa, 25 Sep. 1902, 10,000 ft., *R. S. Williams 1638* (NY—a putative isotype of *X. cryptocarpum* Rusby, which appears to be a nom. nud.). COLOMBIA. ANTIOQUIA: Páramo Frontino, near Llano Grande, *Espeletia* páramo, 3,450 m, *Boeke & McElroy 262* (NY, U). AZUAY. Cordillera Oriental, alrededores del Páramo de Patococha entre Gualaceo y Limón, 6–7 Aug. 1969, 3,400–3,450 m, *Barclay & Juajibioy 8626* (NY). CAUCA: Macizo Colombiano, Valle de Las Papas, alrededores de Valencia, ca. 3 km from Casa, Los Andes, Sta. 10, ca. 3,150 m, 4 Oct. 1958, *Barclay & Juajibioy 5915* (NY); Cordillera Central, cabeceras del Río Palo, altos páramos entre Quebrada de San Paulino y Quebrada del Lopez: Lagunilla de Las Casitas, 3,700 m, 3 Dec. 1944, *Cuatrecasas 19006* (GH). HUILA-CAUCA: Macizo Colombiano, Páramo de Las Papas, El Boquerón, paramo abierto y bosque Filo de La Cuchilla que sierra por el sur La Laguna de La Magdalena, 3,450 m, 5 Sep. 1958, *Idrobo et al. 2967* (VEN). LOJA: Muletrack Amaluza–Palanda, western slope near pass (at Laguna Areviatadas Pilares), 3,350–3,450 m, 22 Sep. 1976, *Ollgaard & Balslev 9680, 9707* (NY). PERU. CUSCO: Paso de Tres Cruces, Cerro de Cusilluyoc, 3,800–3,900 m, 3 May 1925, *Pennell 13886* (F, NY).

This variety is distinguished from the others primarily by its low habit, seeding spikes often overtopped by leaves, and distinctly shorter, coarsely reticulate seeds.

26C. Xyris subulata var. **acutifolia** Heimerl, Ann. k. k. Naturh. Hofmus. Wien 21: 63. 1906. *X. acutifolia* (Heimerl) Malme, Ark. Bot. 13(3): 40. 1913. TYPE: Colombia: Depto. Cundimarca, "Bogotá, Goudot" (presumably at W). Figure 26C.

Cespitose glabrous perennial, the stems contracted to slightly elongated. Leaves erect or slightly spreading, to 2 dm long; sheaths mostly ½ as long as blades or less, the bases shining, pale brown to brown or tan, mostly narrowing gradually into blades, eligulate or with narrow, scarious ligules to 2 mm long, entire; blades filiform to narrowly linear, 0.5–2 mm wide, slightly to very flattened, often twisted, narrowly acute apically, incurved, the margins smooth to papillate-scaberulous or

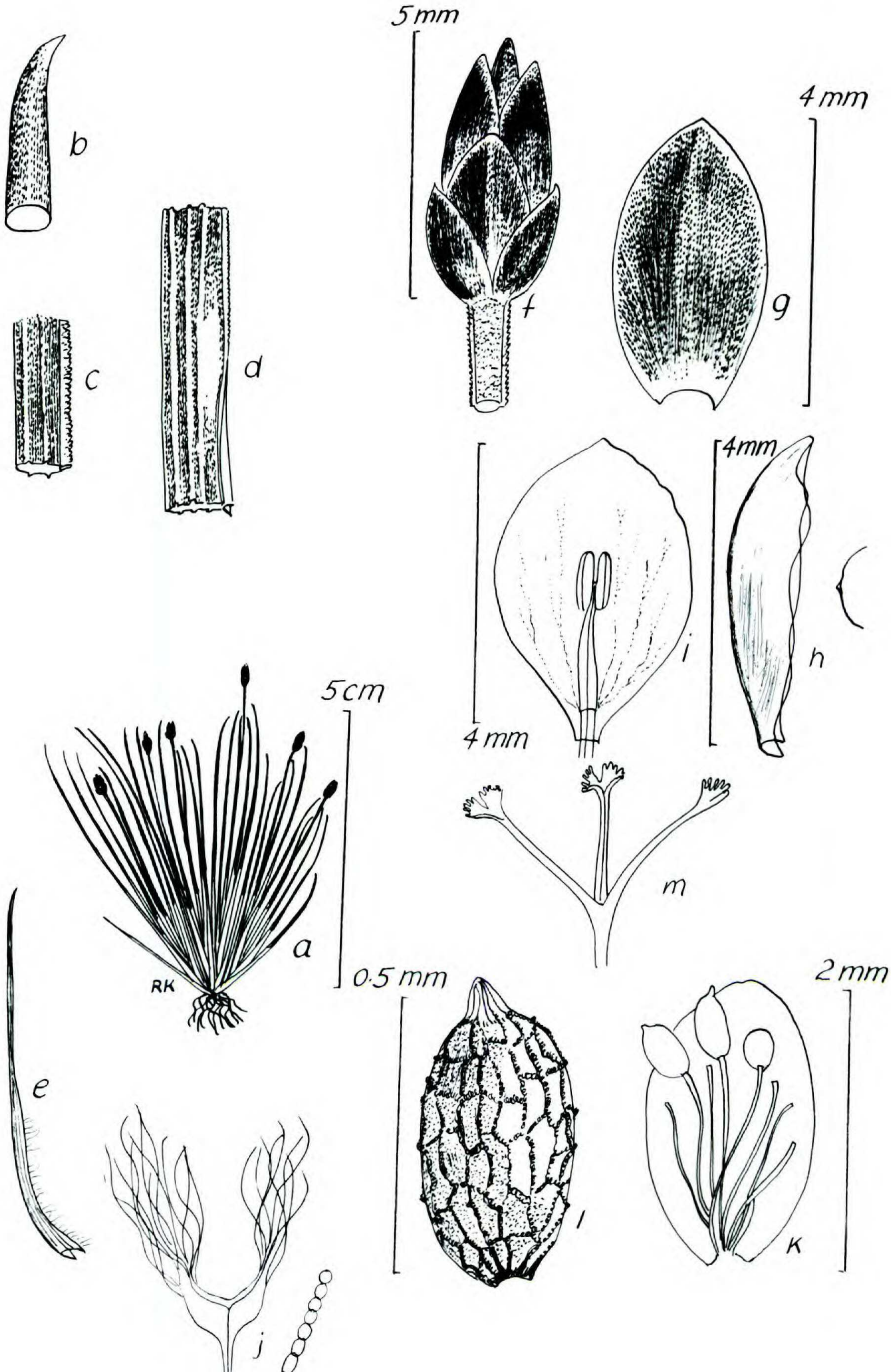


FIGURE 26B. Xyris subulata *var.* breviscapa *(*Barclay & Juajibioy 5915*)*.—*a. Habit sketch.—b. Leaf apex.—c. Midsector of leaf blade.—d. Leaf blade–sheath junction.—e. Leaf.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode.—k. Capsule, two valves removed to show basal placentation.—l. Seed.—m. Stylar apex.*

pale-ciliolate, the surfaces deep green, strongly or weakly nerved, smooth to papillose-rugulose, the latter particularly toward base. Scapes to 3 dm high, straight or flexuous, twisted, narrowly lineal, 0.5–1 mm thick, distally terete or oval, ecostate to commonly bicostate, the surfaces smooth to papillose-rugulose, the costae smooth to scabrid. Scape sheaths shorter than leaves, with short, erect blades. Spikes narrowly oblong to ovoid, mostly blunt, 0.5–1 cm long, the bracts decussate, thin, mostly ecostate, entire, deep olive brown, reddish brown or (mostly) near black, the sterile bracts usually 4, the lowest pair strongly keeled, ca. ½ spike length or less, the inner pair broader, slightly longer and ecostate, the fertile bracts 2–4, broadly ovate, narrowly or broadly rounded apically, the backs papillose to smooth, folded-rounded. Lateral sepals oblong-linear to elliptic-linear, free, subequilateral, mostly navicular, 4–6 mm long, narrowly to broadly acute, with or without keel, entire to ciliolate or papillate along the crest or back medially. Petal blades mostly ovate, 4–5 mm long, pale yellow, narrowly rounded apically, coarsely erose. Staminodia bibrachiate, with broad, flat branches apically multipenicillate. Anthers oblong, ca. 2 mm long, blunt, widely separated by broad connective on filaments ca. 2 mm long. Fruit ellipsoid, ca. 3–4 mm long, the placentation basal-central, the funicles elongate; capsule valves without septa or with septa only at base. Seeds ellipsoid-fusiform, ca. 0.7–1 mm long, deep amber, strongly longitudinally multiribbed.

Distribution. Páramos, high mountain bogs, western cordilleras, mostly over 2,000 meters high, Costa Rica south through the Andean chains to Peru, locally abundant.

Selected additional specimens examined. COLOMBIA. ANTIOQUIA: Páramo Frontino, Cerro de Campanas, *Boeke & McElroy 287* (NY). BOYACÁ: Sierra Nevada del Cocuy, Páramo Cóncavo, *Cleef 10004* (COL, U, US, VDB). CAUCA: Valle de Las Papas, near Valencia, *Core 999* (GH, NY); Cundimarca, páramo entre Cógua y San Cayetano, Laguna Verde y alrededores, 500 m al NW de La Laguna Verde, *Cleef 6240* (COL, U, VDB). META: Páramo de Sumapaz, Hoya de La Quebrada Sitiales, Vallecito Pantanoso 0.5 km SW de La Laguna La Primavera, *Cleef 1050* (U, US, VDB). HUILA: "Balsillas" on Río Balsillas, *Rusby & Pennell 775* (GH, NY); Norte de Santander, Páramo del Hatico, en route from Toledo to Pamplona, *Killip & Smith 20620* (GH, PH, NY). COSTA RICA. CARTAGO: bog in cloud forest along Pan Am. Highway near Cerro Las Vueltas, *Holm & Iltis 444* (F, GH, MO, NY, U, US). LIMÓN: Cordillera de Talamanca, Valle de Silencio, along Río Terbi 1.5 airline km W of Costa Rican–Panamanian border, 2,300 m, *Davidse et al. 28575* (MO, VDB, VEN). SAN JOSÉ: cloud forest area N of Cerro de La Muerte, Cordillera de Talamanca, *L. O. Williams et al. 24146* (F, NY, US). PERU. AMAZONAS: Chachapoyas, Jalca zone 3–6 km W of Molinopampa, *Wurdack 1405* (GH, NY, US). PASCO: Oxapampa, trail to summit of Cordillera Yanachaga via Río San Daniel, *D. N. Smith 7714* (MO, VDB). VENEZUELA. ANZOATEGUI: Cerro Peonia above Sta. Cruz, headwaters of Río Manantiales, E of Bergantin, *Steyermark 61697* (F, NY, US, VEN). LARA: trail from Hunocaro to Buenas Aires (Caserio) below Páramo Las Rosas, *Liesner et al. 8118* (MO, VDB). MERIDA: Páramo de Sto. Domingo, *A. Jahn 1102* (GH, MO, NY, US, VEN); San Raphael, *E. Reed 854* (US). SUCRE: Cerro Turumuquire, *Steyermark 62624* (F, MO, NY, US, VEN). TACHIRA: Páramo de Tama, cerca de la frontera Colombo–Venezolana, *Steyermark & Dunsterville 98625* (F, NY, US, VEN). TRUJILLO: Su-Oaramo y páramo de Guaramacal, *F. Ortega 2654* (MO, PORT, NY, VDB).

This is the most abundant variety, therefore the most collected, and is usually distinguished from the others by its generally shorter stems, paler brown sheaths, and particularly its entire (vs. long-ciliate) leaf-sheath margins.

27. Xyris valdeapiculata Kral, sp. nov. TYPE: Venezuela. T. F. Amazonas: Dpto. Río Negro, Valle de Titirico N of Pico Phelps in Cerro Neblina, ca. 0°56′N, 65°58′W, ca. 2,200 m; peat bog interspersed with shrub and low, rocky but wet ridges, 1 Dec. 1984, fls. open in A.M., *R. Kral 71919* (holotype, VEN; isotypes, F, MO, NY, US, VDB). Figure 27.

Planta perennis, caespitosa, glabra, gracilis. Radices graciles. Caules breves. Folia principalia leviter expansa vel flabellate expansa, 8–14 cm longa, vaginis scaporum longiora; vaginae integrae, basin versus ecarinatae, pallide brunneolae, nitidae, leviter dilatatae, multicostatae, in laminas gradatim decrescentes et carinatae, ad apicem breviligulatae; laminae anguste linearia, 2–3-plo vagines longiores, 1–2.5 mm latae, compressae, olivaceae, longitudine leviter multinervosae; apices incurvato-acuta, leviter incrassata; margine tenuis, retrorse scabrociliatae, pallidae. Scapi leviter torti vel recti, 20–35 cm alti, ca. 1 mm lati, ad apicem subteretes sed prominente bicostatae, costis dense pallide scabrociliatis. Spicae pauciflorae, brunneolae, anguste turbinatae (demum late turbinatae) ca. 10 mm longae; bracteae sine area dorsali, laxe

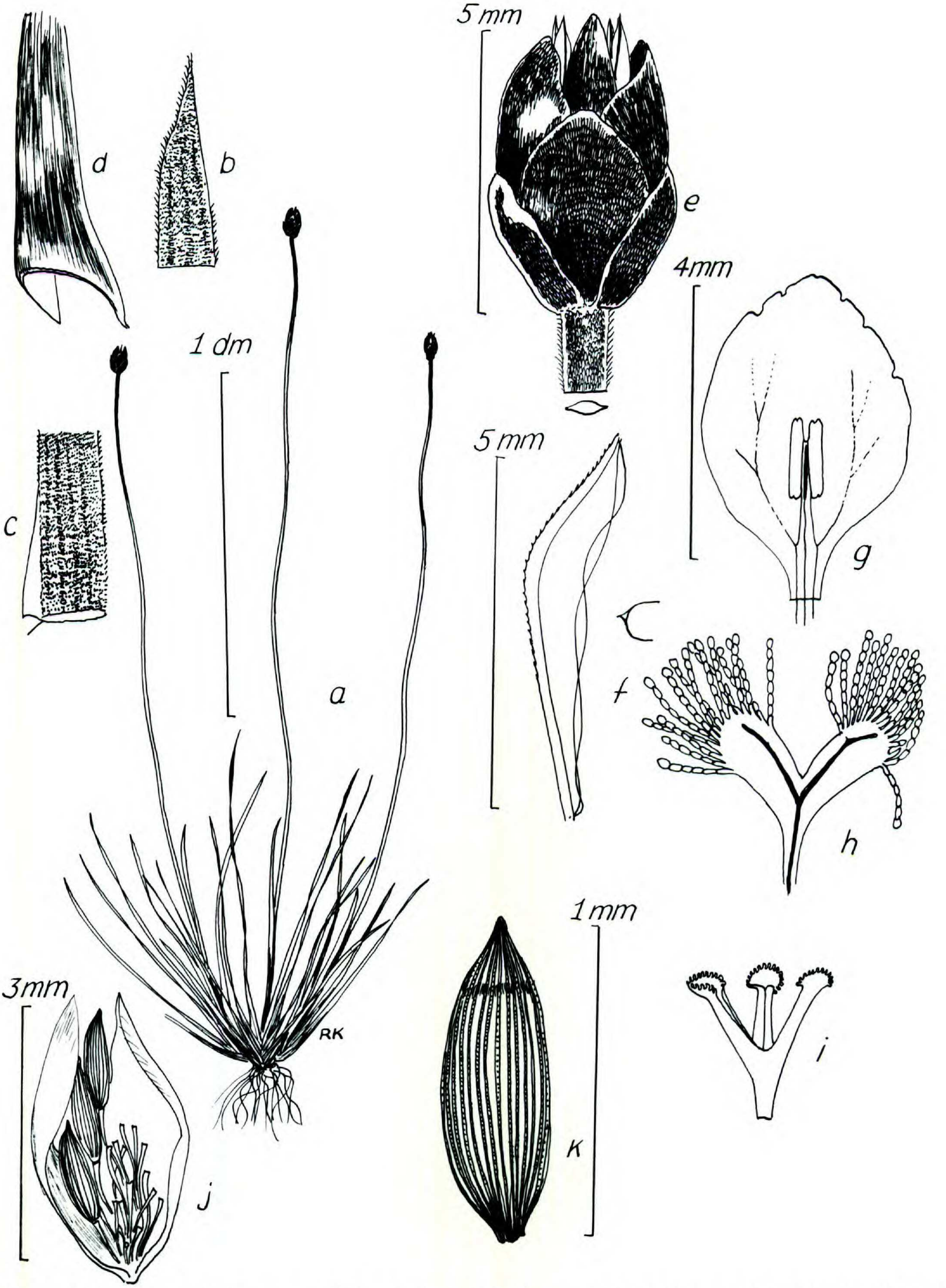


FIGURE 26C. Xyris subulata *var.* acutifolia *(*Steyermark & Dunsterville 101199*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike and upper scape.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule, showing basal–central placentation.—k. Seed.*

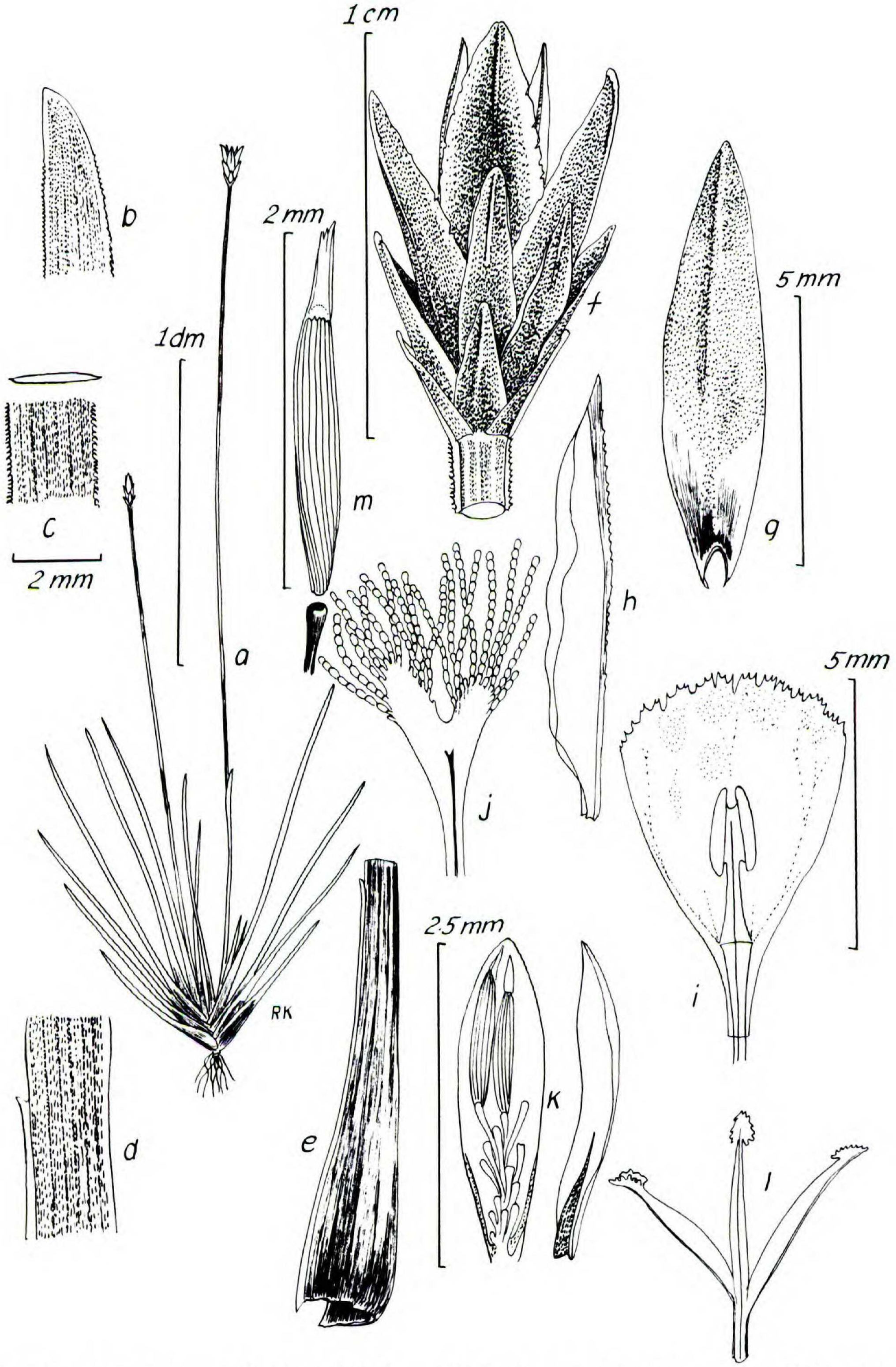


FIGURE 27. Xyris valdeapiculata (Kral 71919).—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade, midsector.—d. Leaf blade–sheath junction.—e. Leaf base.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode.—k. Capsule outline, free-central placenta imposed; oblique view of valve.—l. Stylar apex.—m. Seed.*

spiraliter imbricatae, leviter expansae, integrae, infimae 5–6 steriles, par inferior anguste triangulata, ca. 4 mm longa, valde carinata, scabrociliata, 2–3-plo fertiles breviores, intimae leviter longiores, lanceolatae, carinatae, usque ad 5 mm longae, in fertiles abrupte transientes; bracteae fertiles late lanceolatae, usque ad 8 mm longae, a medio ad apicem valde carinatae, integrae (demum laceratae). Sepala lateralia libera, subaequilateralia, 7–8 mm longa, acuminata, leviter curvata, ala carinali angusta, incrassata, integra vel leviter scabrida. Laminae petalorum obtriangulatae, luteolae, ca. 5 mm longae, apice laceratae. Staminodia bibrachiata, brachiis disparibus, oblongis, penicillatis. Antherae oblongae, profunde bifidae et sagittatae, ca. 1 mm longae, filiis ca. 1 mm longis. Capsula matura anguste ellipsoidea, 4.5 mm longa, acuta, valvis basin versus septo habens; placenta centralis, funiculis crassis. Semina cylindrica (cum apicula) 2 mm longa, pallide brunneola, opaca, longitudine spiraliter multicostata, apiculo albosquamoso, ca. 0.5 mm longo.

Plants perennial, cespitose, smooth, slender, the roots slender-fibrous. Stems short. Leaves slightly to flabellately spreading, 8–14 cm long, longer than the scape sheaths; sheaths entire, ecarinate toward base, lustrous pale brown, slightly dilated, multicostate, gradually narrowing, carinate into the leaf blades, at apex short-ligulate; blades narrowly linear, 2–3 times longer than the sheaths, 1–2.5 mm wide, flat, olivaceous, finely multinerved; tips incurved-acute, slightly thickened; edges thin, retrorsely scabrociliolate, pale. Scapes slightly twisted or straight, 20–35 cm high, ca. 1 mm wide, subterete toward apex but prominently bicostate, the costae densely pale scabrociliate. Spikes few-flowered, brownish, narrowly turbinate, becoming broadly turbinate, ca. 10 mm long; bracts without dorsal area, laxly spirally imbricate, slightly spreading, entire, the lowest 5–6 sterile, the lowest pair narrowly triangular, ca. 4 mm long, strongly carinate, scabrociliate, 2–3 times shorter than the fertile bracts, the inner bracts slightly longer, lanceolate, carinate, up to 5 mm long, grading abruptly into the fertile bracts; these broadly lanceolate, up to 8 mm long, strongly carinate from middle to tip, entire (aging lacerate). Lateral sepals free, subequilateral, 7–8 mm long, acuminate, slightly curvate, the keel narrow, thick, entire to slightly scabrid. Petal blades obtriangular, yellow, ca. 5 mm long, apically lacerate. Staminodia bibranched, the branches unequal, oblong, penicillate at tips. Anthers oblong, deeply bifid and sagittate, ca. 1 mm long, on filaments ca. 1 mm long. Mature fruit narrowly ellipsoid, 4.5 mm long, acute, the valves with septa toward base; placenta free-central, with thickened funicles. Seed cylindric, 2 mm long including apiculus, pale brown, opaque, longitudinally spirally ribbed, the apiculus a pale scale ca. 0.5 mm long.

Distribution. Known only from the type locality.

In general dimensions and in strongly two-edged, ciliate scape, the new species resembles *X. bicostata* Maguire & Lyman B. Smith but lacks a dorsal area. Also, the lustrous brown leaf sheaths are entire rather than long-ciliate. In the locale, it is associated with an abundance of *X. xiphophylla* Maguire & Lyman B. Smith, *X. bicostata* Maguire & Lyman B. Smith, and *X. atriceps* Malme. Its petals unfold in late morning. As in several of the high-tepui endemics of the Guayana Highland, *X. valdeapiculata* has an elongated (2 mm) seed, the name for the species chosen to reflect the long, pale, thin apiculus.

28. Xyris tatei Malme, Bull. Torrey Bot. Club 58: 324, pl. 24, fig. 1A. 1931. TYPE: Venezuela. T. F. Amazonas: moist slopes of the Savanna Hills, summit of Mount Duida, 4,400 ft., *G. H. H. Tate 835* (lectotype, NY; phototypes, F, NY). Figure 28.

Robust, cespitose, hard-based perennial 6–9 dm high, the stem stout, contracted, or up to 9 cm long. Leaves spreading flabellately or ascending, 2.4–6 dm long; sheaths eciliate, usually ½ as long as blades, or shorter, broad at very base, lustrous deep red-brown or castaneous, thence upward shading to pale green, narrowing gradually to blade, there with an erect, pale, triangular ligule 1–2 mm long; blades linear, flattened, 3–7 mm wide, narrowing gradually above middle, abruptly narrowed at apex, incurved-acute, the tip somewhat incrassate; margins slightly to very thickened, pale, smooth or papillose; surfaces green, multinerved, smooth. Scape sheaths

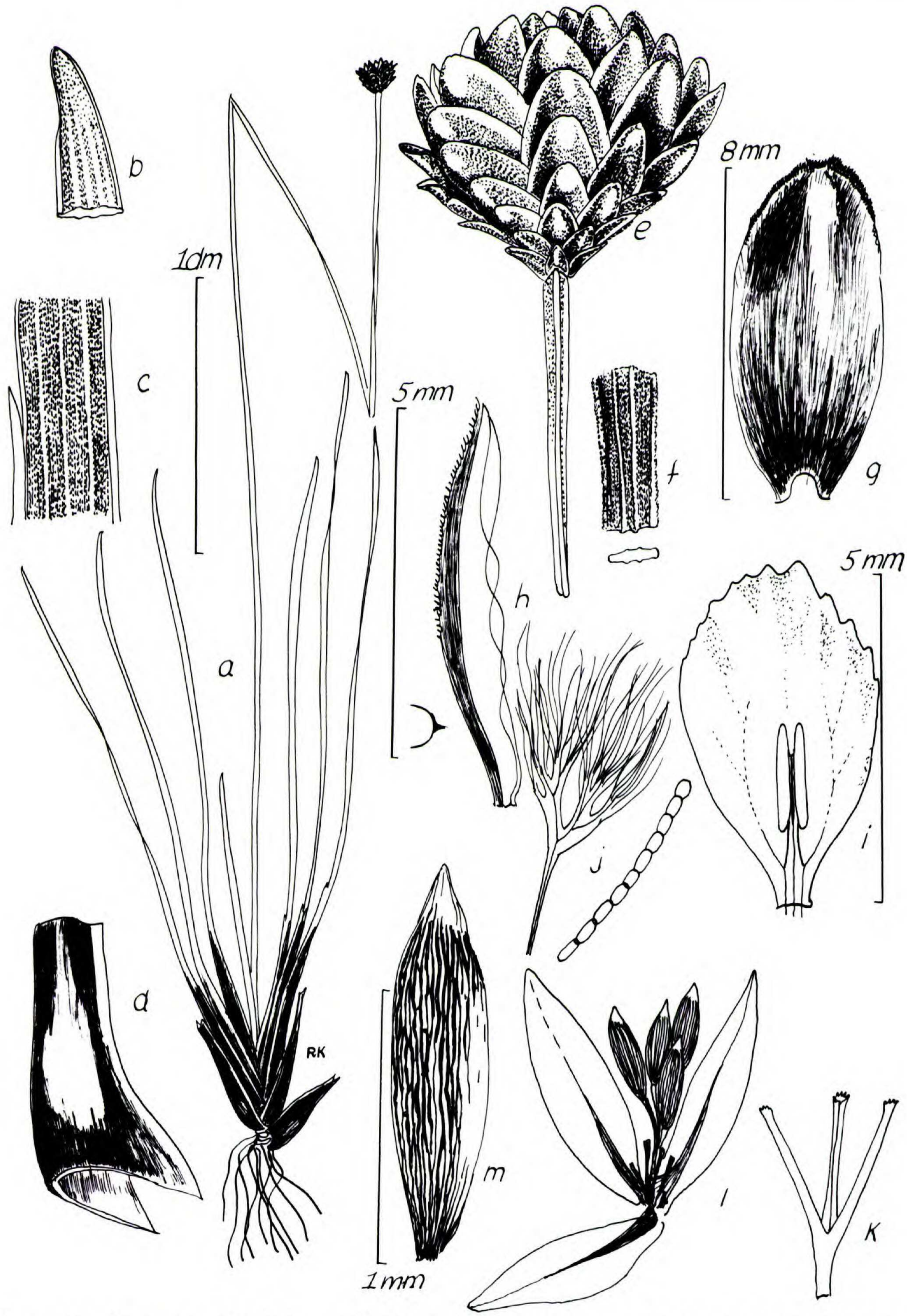


FIGURE 28. Xyris tatei (Tate 835).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at blade–sheath junction.—d. Leaf base.—e. Spike.—f. Sector of upper part of scape.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode, enlarged tip of beard hair.—k. Stylar apex.—l. Capsule, spread at maturity to show basal–central orientation of placenta, septa of valve bases.—m. Seed.*

shorter than leaves, tubular and costate at base, keeled, open toward apex, producing a short, erect blade. Scapes flattened distally, 2–3 mm wide, the edges comprising 2 densely papillate pale costae, the sides sometimes with 1–2 more lower costae. Spikes globose to hemispherical or broadly turbinate, 1–1.5 cm high, the base attenuate, with many firm, lustrous brown, imbricate bracts in nearly vertical rows and without dorsal areas; fertile bracts numerous, the lowest bracts much smaller than the fertile bracts, ovate-triangular, carinate, grading into the fertile bracts, these broadly oblong to obovate, 6–8 mm long, broadly rounded at apex, with reddish scarious (rarely also reddish ciliolate) borders or subentire, the backs low-convex with a low, pale median nerve toward apex. Lateral sepals free, equilateral, narrowly oblong-elliptic, ca. 6–6.5 mm long, acute, reddish brown, the firm keel red-ciliolate from middle to apex. Petal blades obovate, ca. 5–5.5 mm long, the narrowly rounded apex and margins erose. Anthers oblong-lineal, 2–2.2 mm long, deeply bifid and shallowly auriculate, on erect filaments ca. 1 mm long. Staminodia with branches rebranched, the flattened ultimate branchlets long-penicillate. Capsule narrowly ellipsoid, acuminate, ca. 4–5 mm long, the placentation appearing basal-central, but each valve with a strong septum at base. Seeds few, cylindrical-fusiform, ca. 1.5–2 mm long, dark amber with apex conic and pale, the body finely and prominently longitudinally multiribbed.

Distribution. Known only from high, wet, rocky savanna, Cerro Duida, at elevations over 1,000 meters.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Cerro Duida (all specimens): Río Cunucunuma, occasional in moist places in open scrub, basin of Caño Negro at 2,000 m, *Maguire, Cowan & Wurdack 29694* (NY); open places near summit of Culebra Peak, 1,800 m, *Maguire 29155* (NY, VEN); Río Cunucunuma, to 1 m high, occasional along Culebra Creek at 1,100 m, *Maguire, Cowan & Wurdack 29511* (NY); moist slopes of Savanna Hills, summit of Mt. Duida, 4,400 ft., *Tate 778* (NY).

This taxon resembles *X. albescens* Steyerm. superficially, but that species has its leaf-blade edges and its scape edges prominently ciliate with pale hairs, while its seeds are longer and much narrower.

29. Xyris melanovaginata Kral & Lyman B. Smith, sp. nov. TYPE: Venezuela. Bolívar: Dist. Piar, Macizo del Chimantá. Sección oriental del Chimantá-tepui, cabeceras del afluente derecho superior del Río Tirica ("Caño del Grillo"), 5°18′N, 62°3′W, ca. 2,450 m, 7–9 Feb. 1983, *O. Huber & J. A. Steyermark 7136* (holotype, VEN; isotype, VDB). Figure 29.

Planta robusta, perennis, caespitosa, 5–10 dm alta, basibus firmis, per bases persistentes veternas foliorum obtectis. Caules incrassati, varie elongati (basibus in substratio profunde elongati). Folia principalia rigida, disticha, flabellate expansa, 2–3 dm longa; vaginis scaporum longiora; vaginae integrae, vulgo laminis aut dimedio breviorae vel minus, lamprocastaneae, sursum in laminas gradatim contractae, ad apicem ligulatae, ligula anguste triangulata, ca. 2 mm longa; laminae planae, ensiformi-lineares, 4–6 mm latae, apices incurvati-acuti, incrassati; margines integri vel ciliolati aut pallide ciliatopilosi; paginae atrovirides, leviter multinervosae, glabrae. Vaginae scaporum foliis breviore, laxae, a basin castaneae, tubulosae, ad apicem carinatae et apertae, laminis brevibus, laminis foliorum similibus. Scapi recti vel aliquantum curvati, valde complanatae, ad apicem ancipiti, 2–4 mm lati, margine glabri vel varie pallide vel albociliatae. Spicae ovoideae vel ellipsoideae aut cylindricae, 1–3 cm longae, obtusae, atroporphyreae vel olivaceicastaneae, attenuatae, multiflorae; bracteae arcte spiraliter imbricatae, steriles multae, fertilibus breviores, latae ovatae vel obovatae, ecarinatae vel ad apicem leviter carinatae, fertiles gradatim profluentes, haec oblongae vel late obovatae, 5.5–7 mm longae, late rotundatae, integrae vel erosae, ecarinatae, leviter convexae, sine area dorsali. Sepala lateralia libera, subaequilatera, oblongo-linearia, ca. 5 mm longa, obtusa, vel acuta, pallide brunneola; ala carinali firma, super mediam ciliolata vel piloso ciliata. Laminae petalorum obovatae, ca. 6 mm longae, luteolae. Staminodia bibrachiata, brachiis longipenicillatis. Antherae latae oblongae, ca. 1 mm longae, filiis ca. 0.5 mm longis. Capsula anguste ellipsoidea vel obovoidea, 4–5 mm longa; placentae axiales. Semina pauca, ellipsoidea, apiculata, 1.3–1.5 mm longa, porphyrea, translucida, longitudine leviter multicostata.

Robust, cespitose perennial 5–10 dm high, the stems stout, contracted or elongated to 2 dm, producing frondlike plates of leaves. Leaves spreading flabellately, 2–3 dm long, sheaths entire, mostly ½ as long as blades or shorter, firm, castaneous, lustrous, tapering gradually from broad bases into blades, there

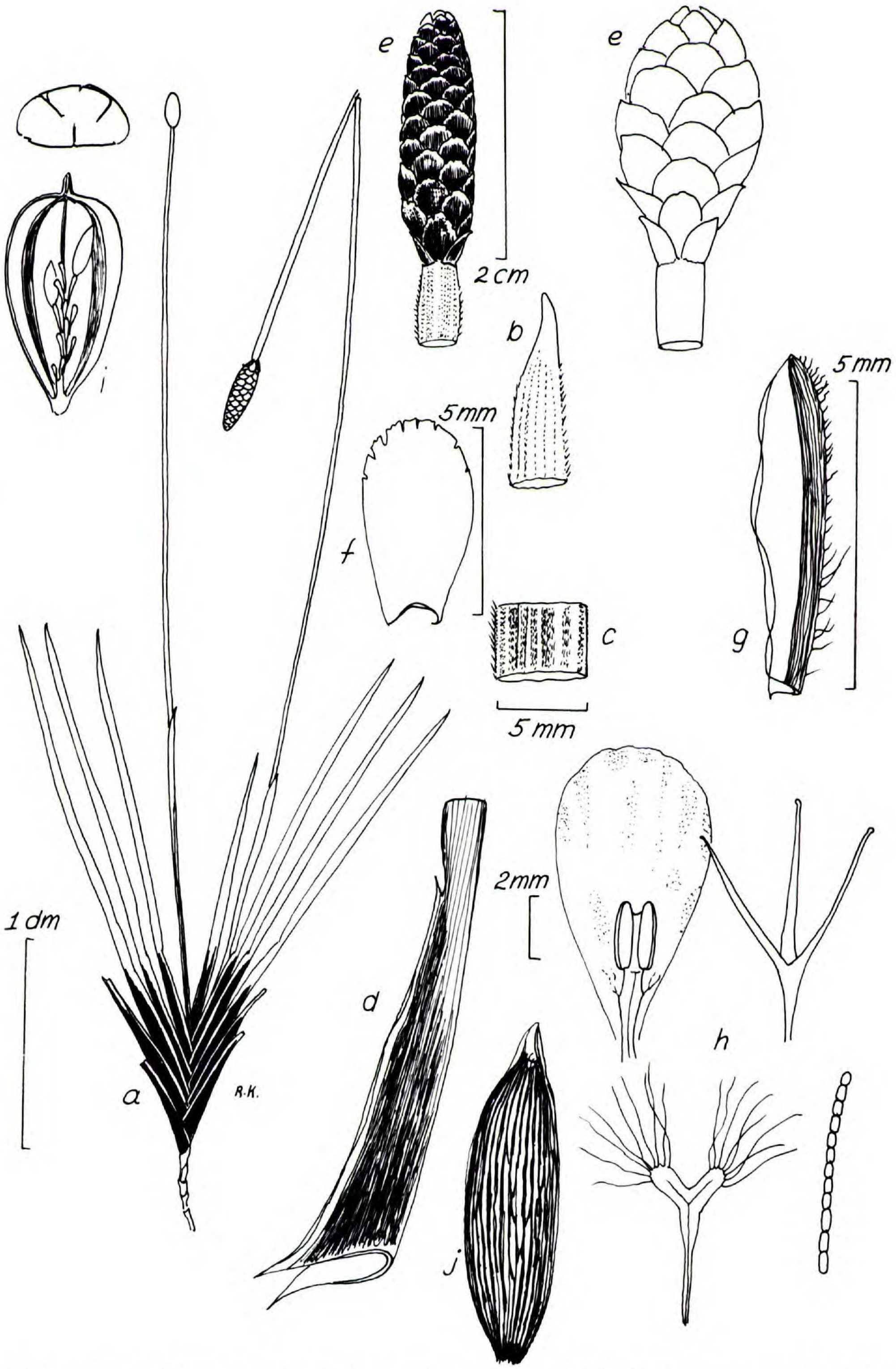


FIGURE 29. Xyris melanovaginata *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf at ca. mid-blade.—d. Leaf base.—e. Two spikes.—f. Fertile bract.—g. Lateral sepal.—h. Clockwise—petal blade and stamen, stylar apex, enlarged sketch of beard hair, staminode.—i. Capsule: above, cross section showing disposition of septa; below, longitudinal view showing placentation, septa shaded.—j. Seed.*

producing a scarious, narrowly triangular ligule ca. 2 mm long; blades flat, gladiate-linear, 4–6 mm wide, the apex incurved-acute, incrassate, the margins usually with submarginal narrow red-brown bands, the edges cartilaginous, smooth or ciliolate or pale-pilose-ciliate, the surfaces deep green, finely multinerved, smooth. Scape sheaths shorter than leaves, proximally castaneous and tubular, keeled and open above, producing a short, flat blade. Scapes strongly flattened, distally ancipital, 2–4 mm wide, the edges smooth to variously pale-ciliate. Spikes ovoid to ellipsoid or cylindric, 1–3 cm long, blunt, dark red-brown or olivaceous-castaneous, attenuate, of many spirally imbricate bracts, the sterile bracts many, broadly ovate to obovate, ecarinate or distally carinate, grading gradually larger into fertile bracts, these oblong to broadly obovate, 5.5–7 mm long, broadly rounded, entire or erose (lacerate in age), ecarinate and but slightly convex-backed, without dorsal area. Lateral sepals free, subequilateral, oblong-linear, blunt or acute, pale brown with firm ciliolate or pilose-ciliate keel. Petals with blades obovate, ca. 6 mm long, yellow, the broadly rounded apex erose. Staminodia bibrachiate, the branches at apex long-penicillate. Anthers broadly oblong, ca. 1 mm long, the connective broad, the filaments ca. 0.5 mm long. Capsule narrowly ellipsoid to obovoid, dorsiventrally compressed, 4–5 mm long, the placentae axile, the valves with prominent septa. Seeds ellipsoid, apiculate, 1.3–1.5 mm long, reddish brown, translucent, longitudinally finely anastomosing-ribbed.

Distribution. So far known only from the Chimantá Massif, there much collected in recent years.

Additional specimens examined. VENEZUELA. BOLÍVAR: sector centro-noreste, 26–29 Jan. 1983, *Huber & Steyermark 6950* (VDB, VEN); en ladera del Río Chimantá Superior, 1 Feb. 1983, *Huber & Steyermark 6983* (VDB, VEN); sector W del Acopan-tepui, 7–9 Feb. 1983, *Huber & Steyermark 7081* (MYF, VEN, VDB); sección oriental del Chimantá-tepui, *Huber & Steyermark 7136* (MYF, VDB); central section near Summit Camp, *Steyermark & Wurdack 347* (NY, US, VEN); island in Río Tirica above Middle Fall below Summit Camp, *Steyermark & Wurdack 487* (NY, US); upper shoulder of Apacará-tepui, SE facing upper shoulder, *Steyermark 75759* (F, NY, VEN); W part of Abacapá-tepui, 13 Apr. 1953, *Steyermark 74851* (F, NY, VEN); sector septentrional, Murey-tepui, 24 Feb. 1978, *Steyermark et al. 115769* (US, VEN), *115836* (MO, US, VEN); cumbre del Cerro Apacará, 8 June 1946, *F. Cardona 1586* (VEN); centro noreste sector, 26–29 Jan. 1983, *Steyermark et al. 128024, 128083, 128131, 128224* (VDB, VEN); Amuri-tepui, 2–5 Feb. 1983, *Steyermark et al. 128459*; same locality, 6 Feb. 1983, *Steyermark 128775* (VDB, VEN); sección oriental, 9 Feb. 1983, *Steyermark et al. 128883* (VDB, VEN); altiplanicie suroriental del Acopan-tepui, 14–16 Feb. 1984, *Steyermark et al. 129866* (MYF, VEN, VDB); Churi-tepui, 3 Feb. 1953, *Wurdack 34307* (NY, US).

This species, obviously abundant on the summits of the Chimantá Massif, and which has been in collections for many years, has been identified variously as *X. decussata* Gl., *X. albescens* Steyerm., *X. tatei* Malme, and otherwise. It is often very long-stemmed and is frequently a "plate" former like *X. witseniodes*, *X. ptariana*, *X. frondosa*, and other species. While it has ancipital scapes that are often ciliate as in *X. decussata*, it lacks the dense, continuous bands of reddish hairs of that species. Its elongate spikes are distinctive. While its scape and leaves are often pale-ciliate, its leaf blades are much longer than its leaf sheaths, its spikes are longer than in *X. albescens*, and its lateral sepals and seeds are shorter. Thus, more by a combination of characters held in part by different species, it is unique.

30. Xyris culmenicola Steyerm., Fieldiana, Bot. 28(1): 1951. TYPE: Venezuela. T. F. Amazonas: Brocchinia Hills, 1,700–1,980 m, Cerro Duida, 1 Sep. 1944, *J. Steyermark 58198* (holotype, F; isotypes, GH, NY, US). Figure 30.

Cespitose, robust, hard-based perennial 5–7 dm high, the stems contracted. Leaves erect to somewhat spreading, 2–3.5 dm long; sheaths entire, less than ½ as long as blades, deep, lustrous, reddish brown or castaneous at base, tapering gradually and keeled from broad base to blade, there essentially eligulate, the blades flat, linear, 2.4–5 mm wide, tapering very gradually from ca. midblade or

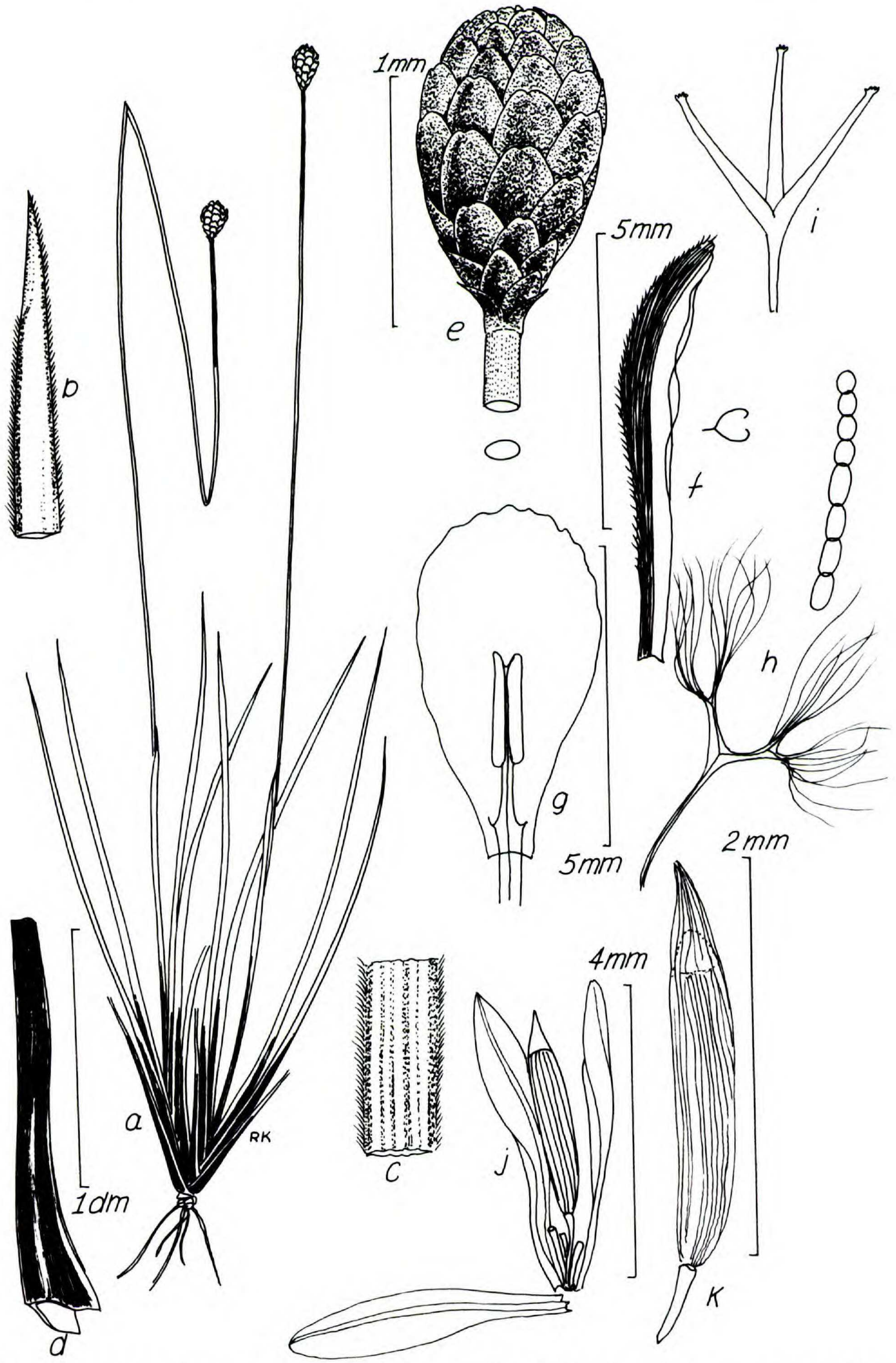


FIGURE 30. Xyris culmenicola *(from holotype)*.—*a. Habit sketch.—b. Leaf apex.—c. Sector of leaf, mid-blade.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal, stamen.—h. Staminode, enlarged sector of beard hair.—i. Stylar apex.—j. Capsule, one valve removed; valve, showing septum.—k. Seed.*

below to a narrowly acute, erect or curvate apex, the tip slightly callused, the margins pilosulous-ciliate, the surface prominently multinerved, smooth, often with alternating broad, red-brown bands, 2 of these making submarginal borders. Scape sheaths much shorter than leaves, loosely tubular and castaneous below, open above, green, carinate and ciliate-keeled, with a short, erect, ciliate, blade. Scapes straight, slightly twisted, distally slightly compressed but in cross section oval or oblong, smooth, low-ribbed. Spikes dark brown, ovoid to broadly ellipsoid or broadly obovoid, 1.5–2 cm long, blunt, attenuate-based, of many firm, spirally imbricate, entire bracts without dorsal areas. Sterile bracts many, the lowest by far the smallest, keeled, ovate-triangular, grading gradually to fertile bracts, the fertile bracts obovate to oblong, 7–8 mm long, entire (becoming somewhat lacerate), often emarginate, the apex broadly to narrowly rounded, the backs ecarinate, slightly convex, not folded. Lateral sepals free, subequilateral, linear-oblanceolate, ca. 7–7.5 mm long, broadly acute, pale brown, curvate, the strong, dark keel rusty-ciliate from middle to apex. Petal blades broadly obovate, ca. 6 mm long, yellow, the broadly rounded apex erose. Staminodia quadribrachiate, the branches long-penicillate. Anthers oblong, ca. 1.5 mm long, short-bifid, auriculate, on filaments ca. 1 mm long. Capsule cylindric, ca. 4 mm long, the placentation apparently basal but with 3 strong septa intruding except at ovary apex. Seeds few on long funiculi, narrowly cylindric-fusiform, ca. 2 mm long, pale brown, translucent, including a translucent, pale, conic appendage ca. 0.5 mm long (outer integument), the body longitudinally multiribbed with a few coarser ribs produced by the outer integument.

Distribution. Grassy, rocky, wet savanna, summit elevations along Cerro Duida and Cerro Marahuaca, T. F. Amazonas, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: gallery forest and open area on Plateau of Huachamacari, 1 Mar. 1985, *Liesner 18121A* (MO, VDB, VEN); Cerro Huachamacari, Río Cunucunuma, near E escarpment at 1,900 m, *Maguire et al. 30123* (NY, US); summit of Cerro Duida, Brocchinia Hills, above Vegas Falls, 1 Sep. 1944, *Steyermark 58141* (F, K, NY, VEN, US); summit of Cerro Duida, Savanna Hills, 1,025–1,200 m, 2 Sep. 1944, *Steyermark 58233* (F, NY, US—a cotype); Cerro Marahuaca, cumbre, sección noroccidental, 2,500 m, 16 Feb. 1981, *Steyermark et al. 124426* (MO, VEN); Cerro Marahuaca, cumbre altiplanicie no arbolada, 2,580 m, 31 Jan. 1982, *Steyermark et al. 125892* (VEN, VDB); Cerro Marahuaca, parte aislada al Sur-Oeste del Cerro, 2,480 m, 9–10 Feb. 1982, *Steyermark et al. 126290* (VDB, VEN); Cerro Huachamacari, cumbre, 1,800 m, 10 Feb. 1982, *Steyermark et al. 126451*; Cerro Marahuaca, cumbre, parte central de la Meseta Sur-Este, 2,560 m, 10–12 Oct. 1983, *Steyermark 129444* (VDB, VEN); Cerro Duida, 29 Jan.–11 Feb., 1975, *S. S. Tillett et al. 751-74* (topotype, MYF, NY, VEN).

This falls in treatments next to *X. lugubris*, *X. tatei*, and *X. albescens* but is distinct in its longer spike, duller bracts, and more uniformly tapered, distinctively pigmented leaf blades, these sharper at apex.

31. Xyris lugubris Malme, Bull. Torrey Bot. Club 58: 324, pl. 24, fig. 1A. 1931. TYPE: Venezuela. T. F. Amazonas: summit of Mount Duida, 7,100 ft., Peak No. 7, *G. H. H. Tate 639* (Tyler–Duida Expedition Aug. 1928–Apr. 1929) (holotype, NY; phototype, NY). Figure 31.

Cespitose, hard-based perennial 3–10 dm high, the stems mostly contracted. Leaves erect or ascending, 2–5.5 dm long, the sheaths entire, less than ½ as long as blades, deep lustrous red-brown, smooth or papillate, keeled, gradually narrowed to blade, there eligulate or with an erect, narrowly triangular ligule to 4 mm long, the blades flattened, ensiform, 3–5 mm wide, gradually narrowed above middle to a narrowly acute, straight or incurved, thickened tip, the margins blunt or sharp-edged, smooth to papillose or tuberculate-scabrid, the surfaces dull green or green with long bands of brown or red-brown, multiribbed, smooth or papillate. Scape sheaths shorter than leaves, strongly costate, sharply keeled, with short, cusplike blades. Scapes straight or flexuous, distally subterete or slightly compressed, elliptic or oval in cross section, ca. 2 mm wide, smooth or sometimes striate, often punctate. Spikes broadly ob-

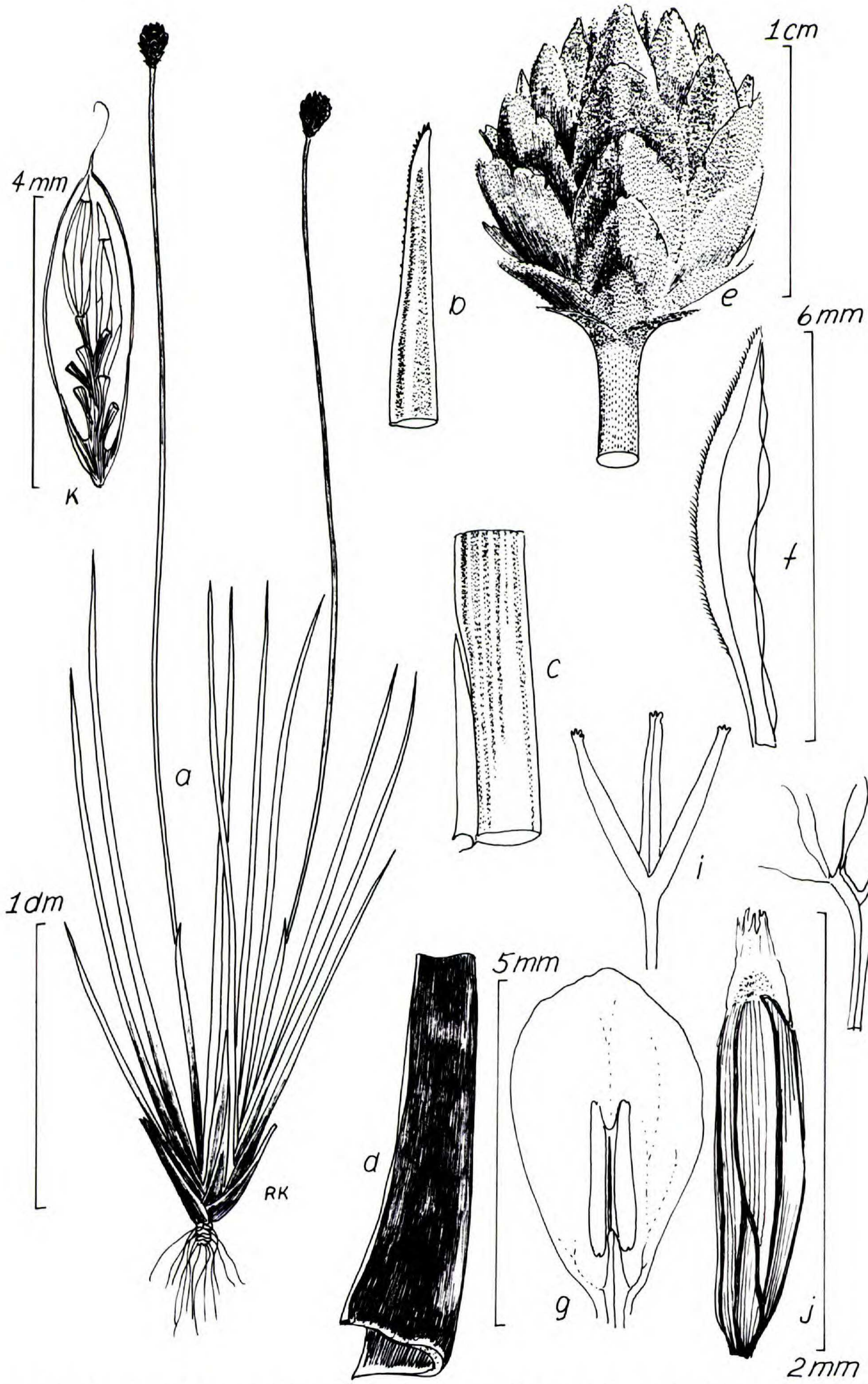


FIGURE 31. Xyris lugubris *(from the holotype).—a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Seed.—k. Fruit, two valves removed to show central-basal placentation.*

ovoid to subglobose or hemispherical, ca. 1 cm long, blunt, of many dull, dark brown bracts in nearly vertical ranks of 5 or more; sterile bracts several, the lowest much smaller than fertile bracts, grading into them, the fertile bracts broadly oblong, 6–8 mm long, rounded and slightly folded, the apex narrowly rounded, the margins entire or lacerate, the backs folded-convex, often low-carinate toward apex. Lateral sepals equaling bracts, 6.5–8 mm long, linear-elliptic, dark red-brown, apically acute or narrow but blunt, the keel ciliolate from near base to apex. Petal blades obovate, 5–7 mm long, yellow, the apex narrowly rounded, the margins subentire. Staminodia bibrachiate, the broad, flattened branches sparsely penicillate. Anthers lance-oblong, ca. 2 mm long, deeply bifid and sagittate, on filaments ca. 0.5 mm long. Capsule ellipsoid, 4–6 mm long, the placentation central, the valves septate only near base. Seeds rather few, cylindrical, ca. 2 mm long, including a pale, squamiform apex ca. 0.5 mm long, coarsely longitudinally few-ribbed and finely lined.

Distribution. Wet, rocky savanna at or near summits, cerros Sipapo, Duida, and Neblina, T. F. Amazonas, Venezuela, infrequent.

Additional specimens examined. VENEZUELA, T. F. AMAZONAS: Camp Savanna, Campo Grande, 1,500 m, Cerro Sipapo, 10 Dec. 1948, *Maguire & Politi 27582* (GH, NY, US, VEN); Duida near summit of Culebra Peak, 1,800 m, 22 Apr. 1949, *Maguire 29155* (GH); Neblina, Río Yatua, west headland, open cumbre savanna 5 km W of Cumbre Camp, 2,000 m, 6 Jan. 1954, *Maguire et al. 37121* (F, K, NY, US, VEN); Neblina, W escarpment savanna 4–8 km S of Cumbre Camp, 1,850–1,900 m, 15 Jan. 1954, *Maguire et al. 37299* (NY); Neblina, en la cumbre del brazo nor-occidental, al norte del campamento base a lo largo del Río Mawarinuma, afluente del Río Baria, 1,880 m, 7–8 Feb. 1984, *Luteyn & Steyermark 9453* (NY, VDB, VEN); *Steyermark & Luteyn 129818* (MO, NY, VDB, VEN).

32. Xyris thysanolepis Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 17, fig. 3A–F. 1963. TYPE: Venezuela. Bolívar: rare around moist depressions and swales bordering river, scrub forest near Summit Camp, 1,925 m, central section Chimantá Massif, 2 Feb. 1955, *J. A. Steyermark & J. J. Wurdack 356* (holotype, NY; isotypes, MO, NY, US, VEN). Figure 32A–C.

A study of Venezuelan *Xyris* done in a way to reveal complexes has brought *Xyris thysanolepis*, *X. jauana*, and *X. sipapoa* into close alignment. In preparing descriptions and illustrations from type material of the three, and in studying materials collected later by myself and other collectors, I was forced to reassess taxonomic rank. *Xyris thysanolepis* and *X. sipapoa* were published in the same work and at that time were considered spatially isolated. *Xyris jauana* was considered well marked primarily on account of its connate lateral sepals, otherwise overlapping morphologically with *X. thysanolepis*. Ordinarily sepal connation, particularly high connation, is a very good character within complexes, but in this complex the character breaks down. A check of the structure shows that while lateral sepals of *X. thysanolepis* may be connate, those of *X. jauana* may be free. A check of type material of *X. sipapoa* shows that sepals range even in a single spike from connate to free. If this usually significant character difference is removed, a complex of three former species becomes a single species of two varieties, as below:

KEY TO THE VARIETIES OF *XYRIS THYSANOLEPIS*

1a. Leaf sheath bases bright to dull brown, eciliate to sparsely ciliate; apices of fertile bracts broadly rounded, the lacerate-scarious borders distinctly red; edges of leaf blades entire or inconspicuously ciliolate ..... *X. thysanolepis* var. *thysanolepis* (including *X. jauana*)

1b. Leaf sheath bases lustrous deep brown or pale brown, mostly evidently ciliolate; apices of fertile bracts narrowed, somewhat keeled, the scarious borders pale or pale red-brown; edges of leaf blades densely ciliolate with fine, white hairs ..... *X. thysanolepis* var. *sipapoa*

What then seems to emerge is a complex of medium- to high-elevation bog plants with scabrid, mostly unicostate scapes and lacerate-bordered, scarious-edged bracts, habitally similar, and showing a morphological affinity to *X. confusa* Smith & Downs of the Andes, possibly also to the Andean *X. andina* Malme.

Variety *thysanolepis* includes what was treated as *X. jauana*, which varies in regard to sepal connation and which (contrary to the type description) bears no evident dorsal area, only a low, short, apical carina. Variety *thysanolepis* is mostly in high areas of the Gran Sabana, Estado Bolívar, with one known outlier in Territorio Federal Amazonas (Cerro Yavi). The more slender var. *sipapoa* is apparently not rare on Cerro Sipapo, and plants answering to the type description have also been collected in Estado Bolívar (bog by rd. to Salto Aponguayo in rocky, sandy seeps, ca. 11 km SE of jct. with rd. to Kavanayen, 27 July 1983, *Kral & Gonzales 70524*, VDB, VEN).

32A. Xyris thysanolepis var. **thysanolepis.** Figure 32A, B.

X. jauana Lyman B. Smith & Steyerm., Bol. Soc. Venez. Ci. Nat. 132–133: 277, fig. 2a–g. 1976. TYPE: Venezuela. Bolívar: Meseta del Jaua, Cerro Jaua, selva de galeria al borde del tributario del Río Marajano, cumbre, 4°48′50″N, 64°34′10″W, 1,750–1,800 m, 22–28 Feb. 1974, *J. A. Steyermark, V. C. Espinosa & C. Brewer-Carias 109390* (holotype, VEN; isotypes, NY, US). Figure 32B.

Slender, solitary to cespitose, soft to firm-based perennial 2–10 dm high, the stem short or elongated to 6 cm, thick, the roots slender-fibrous. Leaves erect to spreading flabellately, 1–3 dm long; sheaths mostly ½ or more as long as blades, the slightly to very (orbicular) dilated base ciliate or not, tan to castaneous, shading above to pink, pale brown or stramineous, narrowing gradually into blade, keeled, the keel ciliolate or entire, the apex eligulate; blades linear, 2–5 mm wide, strongly flattened, the apex narrowly incurved-acute or acuminate, the margins usually thin, entire or ciliolate; surfaces pale green or yellow-green flecked with red, finely nerved, otherwise smooth. Scape sheaths shorter than to nearly as long as leaves, below terete and multicostate, above open, producing a short, erect, incurved-tipped, flat blade. Scapes straight or slightly flexuous, slightly twisted, subterete or oval in cross section toward apex, 1–2 mm wide, with 1, 2, (or more) costae, with 1 costa strong often making 1 edge, ciliate to densely ciliolate-scabridulous, the surfaces otherwise smooth, pale green, striate. Spikes pale red-brown, broadly ellipsoid, drying broadly obovoid, turbinate or globose, 0.7–1.3 cm long, of several spirally imbricate, firm, papillate or rarely smooth bracts with broad, scarious-lacerate, reddish or pale reddish brown borders or at least scarious-tipped; sterile bracts few, the lowest pair much smaller and narrower than the fertile bracts, keeled; fertile bracts broadly oblong to obovate, 6–8 mm long, the backs rounded or somewhat folded (inner ones increasingly folded-carinate), the apices narrowly or broadly rounded, the thin, colored borders variously lacerate and erect to squarrose. Lateral sepals free or up to ⅓ connate, subequilateral, thin, pale, lustrous reddish brown, 6–7 mm long, the apex acute, the narrow, curvate keel rusty-ciliolate to low-serrulate-lacerate from at least middle to apex. Petal blades elliptic to obovate, 4–5 mm long, yellow, the broadly to narrowly rounded apex erose. Staminodia bibrachiate, the narrow branches densely penicillate-ciliate. Anthers narrowly lance-oblong to linear-oblong, 1.5–2 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsule planoconvex, broadly ellipsoid to narrowly obovoid, 3.5–4 mm long, the placentation basal, the valves without septa. Seeds numerous on elongate funicles, cylindric-fusiform, ca. 1 mm long, deep to pale amber, coarsely longitudinally anastomosing-ribbed.

Distribution. Locally abundant along streams through wet, rocky, medium- to high-elevation savanna, in Territorio Federal Amazonas and (more often) Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: depression on summit, Cerro Yavi, 2,200 m, 1–3 Mar. 1947, *Phelps & Hitchcock 38* (NY, VEN). BOLÍVAR: norte de la Cumbre del Cerro Roraima, 2,810 m, 27 Mar. 1982, *Aymard & Luteyn 2479* (NY, PORT); hacia Salto Aponwao (north part of Gran Sabana), 1,200 m, 7 Mar. 1983, *Huber & Entralgo 7405* (MYF); cumbre del Sororopán-tepui al N de Kavanayen, 2,040 m, 28 June 1983, *Huber & Alarcon 7741* (MYF); small stream

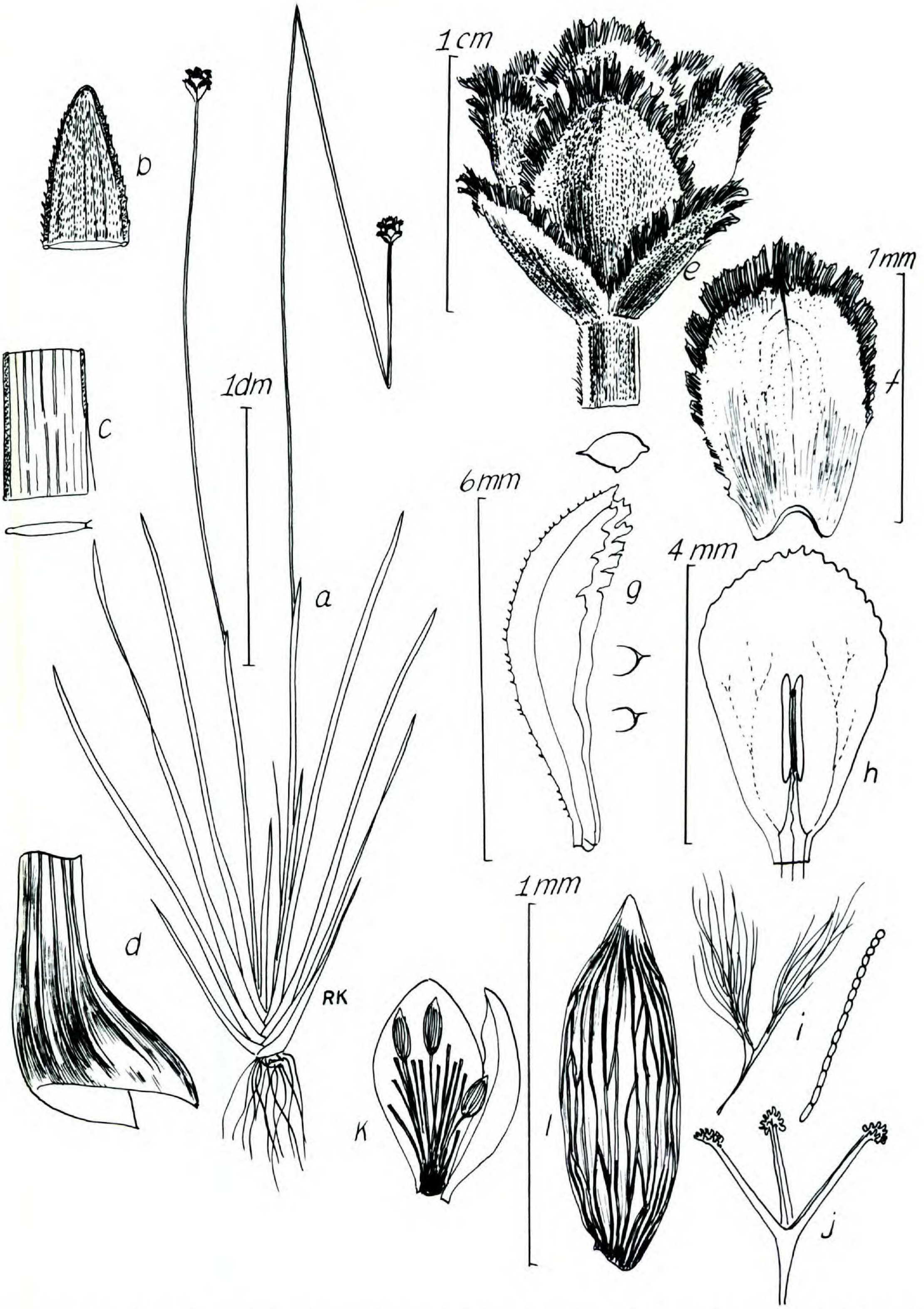


FIGURE 32A. Xyris thysanolepis *(*Kral 70446*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair apex.—j. Stylar apex.—k. Dehisced capsule, showing basal placentation.—l. Seed.*

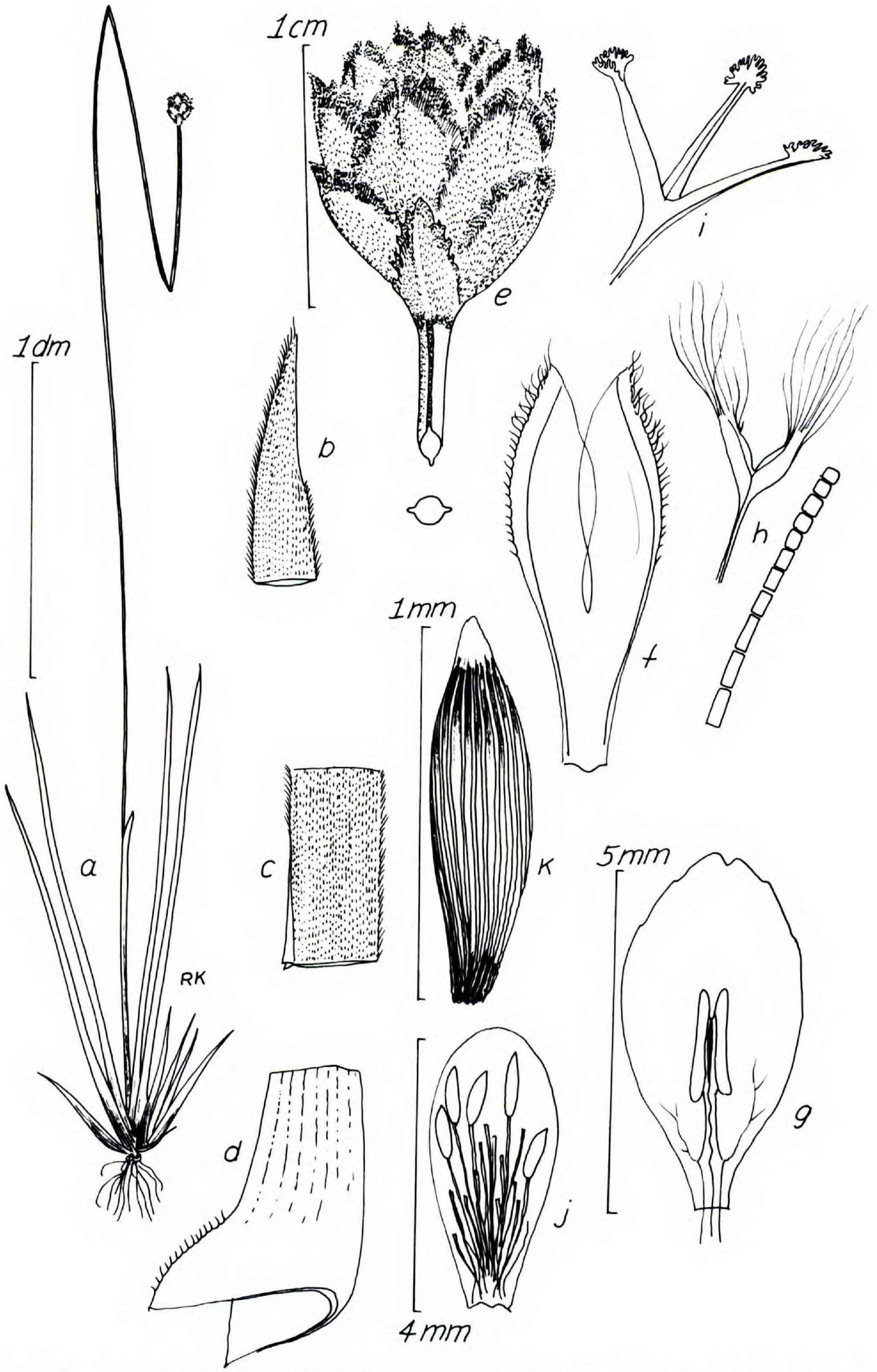


FIGURE 32B. Xyris thysanolepis *(type of* X. jauana*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike, upper scape.—f. Lateral sepals.—g. Petal blade, stamen.—h. Staminode, enlarged beard hair apex.—i. Stylar apex.—j. Capsule outline, placentation.—k. Seed.*

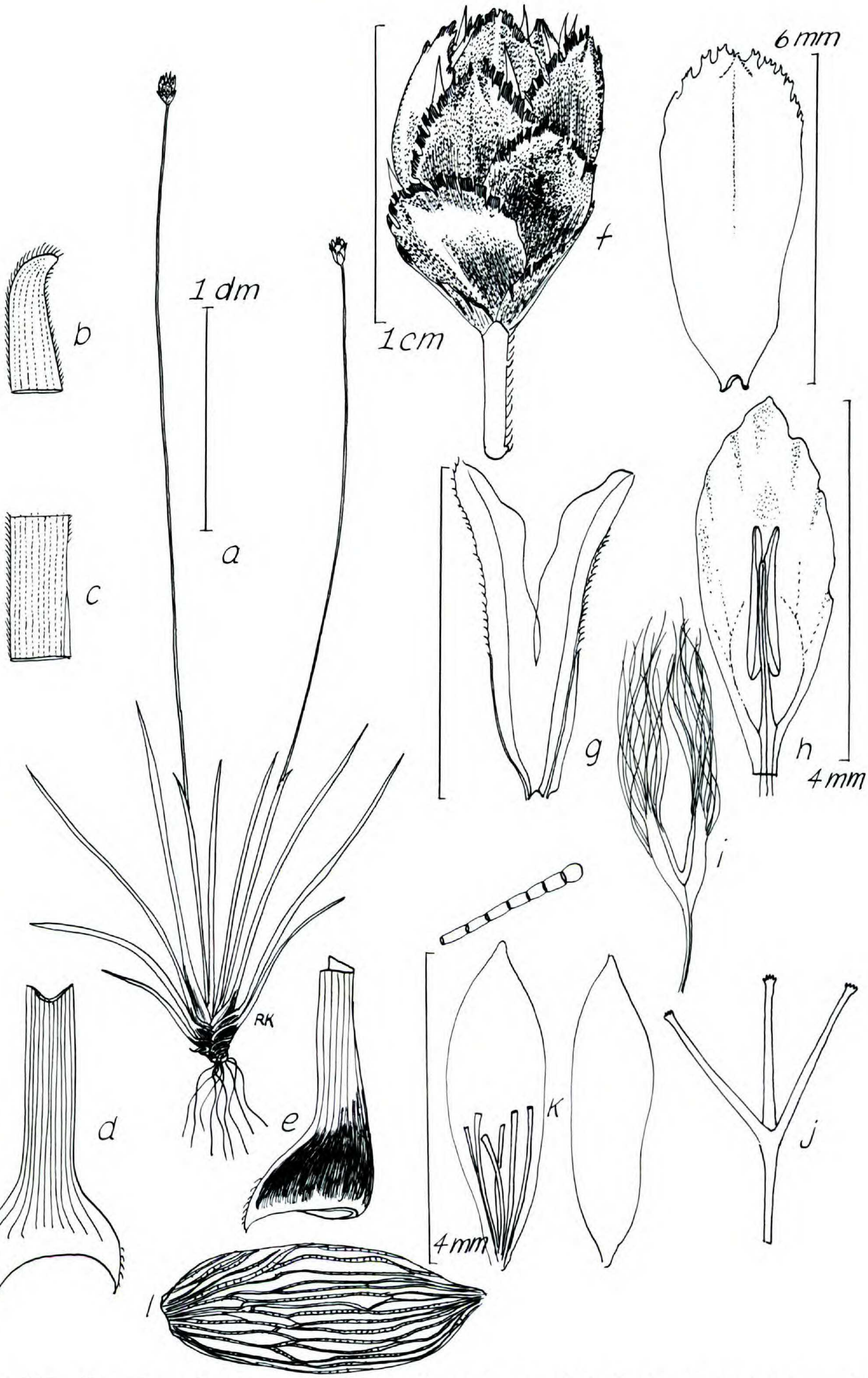


FIGURE 32C. Xyris thysanolepis *var.* sipapoa *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Leaf base, side view.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen (just above, a fertile bract).—i. Staminode, to left an enlarged view of tip of beard hair.—j. Stylar apex.—k. Outlines of capsule with placenta, to right a valve outline.—l. Seed.*

at ravine base in bog ca. 1 km E of Kavanayen, 26 July 1983, *Kral 70446* (F, K, MO, NY, SP, U, US, VDB, VEN); 1.5 km E of Kavanayen, rocky seeps, S side of rd., 27 July 1983, *Kral 70535* (F, K, MO, NY, SP, U, US, VDB, VEN); Macizo del Chimantá, Apacara-tepui, sector Norte del Macizo, ca. 2,200 m, 30 Jan.–1 Feb. 1983, *Steyermark, Huber & Carreno E. 128407* (VDB, VEN).

32B. Xyris thysanolepis var. **sipapoa** (Maguire & Lyman B. Smith) Kral & Lyman B. Smith, stat. nov. *X. sipapoa* Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 18, fig. 4A–F. 1963. TYPE: Venezuela. T. F. Amazonas: frequent, banks of lower Caño Negro along open savannas, alt. 1,400 m, Cerro Sipapo, 25 Dec. 1948, *B. Maguire & L. Politi 27911* (holotype, NY; isotypes, GH, NY, US).

As in the rest of the species but usually somewhat lower in stature, the leaves strongly spreading flabellately, the bases abruptly orbicular-dilated and lustrous, mostly ciliolate, the blades with a fine marginal dusting of white hairs. Spikes mostly ovoid or ellipsoid, drying obovoid, the bracts carinate toward apex, the apex narrowed and folded, the margins pale-lacerate-scarious. Lateral sepals, sometimes in same spike, free to ⅓ connate.

Distribution. Wet to rather dry, medium- to high-elevation rocky savanna, Cerro Sipapo and environs, Territorio Federal Amazonas, Venezuela, and Gran Sabana, Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Cerro Sipapo: frequent in bog-savanna, terraces S of Caño Negro at 1,600 m, 6 Jan. 1949, *Maguire & Politi 28194* (NY, US); frequent in savanna vic. Campo Grande, 1,500 m, 15 Dec. 1948, *Maguire & Politi 27684* (F, GH, NY, US); bog by rd. to Salto Aponguayo in rocky, sandy seeps, ca. 11 km SE of jct. with rd. to Kavanayen, 27 July 1983, *Kral 70524* (VDB, VEN, and to be distributed); savanna, ca. 1,200 m, Torom-meru, NW of Parupa, 14 Dec. 1984, *Kral 72063* (MYF, VDB, VEN, and to be distributed).

33. Xyris concinna N. E. Br., Trans. Linn. Soc. London, Bot. II(6): 68. 1901. TYPE: Venezuela. Bolívar: summit, Mt. Roraima, 8,600 ft., *McConnell & Quelch 496* (lectotype, K). Figure 33.

Hard-based, densely cespitose perennial 0.8–2 dm high, the stem contracted, to 1.5 cm long. Leaves spreading flabellately, 5–10 cm long; sheaths about as long as blades, entire (rarely with a few brown cilia at base), cochleariform toward base, thence contracted abruptly, ciliate-keeled, gradually narrowing to blade, eligulate; blades flat, narrowly linear, 1.5–2.5 mm wide, gradually tapering distally to an attenuate, terete, or narrowly acute, flattened apex, the tip with a tuft or short fringe of stiff, pale hairs, the margins minutely scabrociliate or papillose, the surface finely nerved, green or maroon, smooth. Scape sheath slightly shorter than leaves, loose, scabrid-keeled, short-bladed. Scapes slenderly linear, stiff, ca. 1 mm thick, oval or terete in cross section, unicostate, also finely fluted, the costa smooth, papillose or scabrociliolate. Spikes ovoid, 5–7 mm long, obovoid in fruit, reddish brown, of several spirally imbricate bracts without dorsal area and with broad, pale laceroscarious borders; sterile bracts 2–4, ovate, keeled, grading larger into fertile bracts, these few, lance-ovate or oblong, acute to acuminate, slightly to very keeled, 6–7 mm long, the backs papillose. Lateral sepals free, narrowly oblanceolate, equilateral, ca. 6 mm long, narrowly acute, the sides dull, pale brown, the keel narrow, firm, dark brown, entire or (usually) ciliate from middle to apex. Petal blades ca. 5 mm long, yellow, elliptic, subacute, wavy-margined. Staminodia bibrachiate, the branches flattened, the hairs penicillate but often multiseriate in narrow sheets. Anthers oblong, ca. 2 mm long, apically short-bifid, basally auriculate, on filaments ca. 1 mm long. Capsule oblong-ellipsoid, ca. 3 mm long, the valves eseptate, the placentation basal, funicles long. Seeds fusiform, ca. 1 mm long, red-brown, translucent, finely longitudinally ribbed.

Distribution. Infrequent in wet, high, sandstone savanna, the higher tepuis of the Gran Sabana, Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: Matahui-tepui, 2,700–3,000 m, 22 Aug. 1982, *A. Castillo 2282* (UCV, VDB); Kukenán-tepui, sector mas septentrional, algo separado del macizo principal,

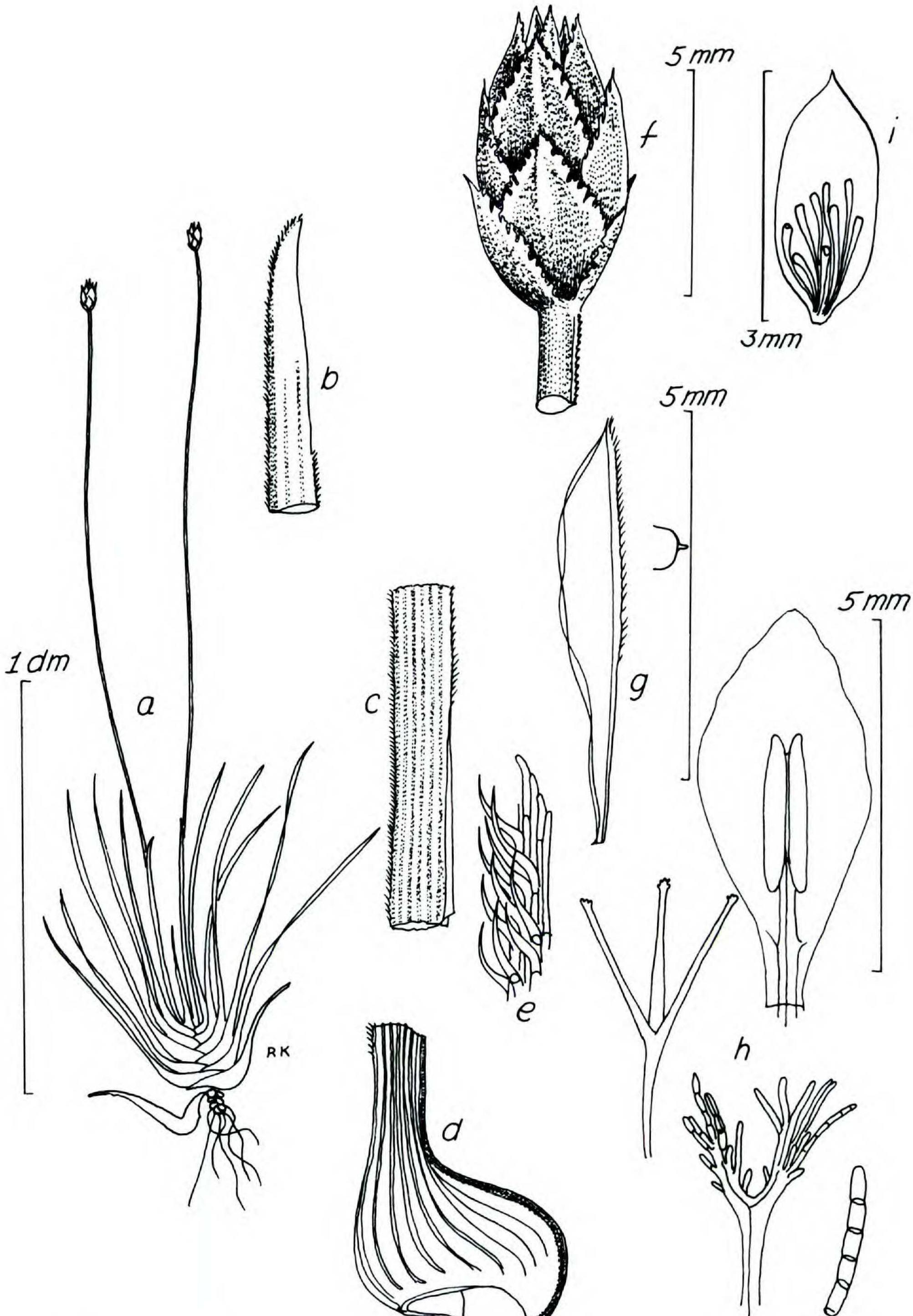


FIGURE 33. Xyris concinna *(*Steyermark 112658*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Small sector of leaf edge enlarged to show hairs.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen, staminode, enlarged part of beard hair, stylar apex.—i. Capsule, two valves removed to show placentation.*

2,500 m, 28 Apr. 1984, *Huber 9449* (MYF, VDB); Cumbre del Ilú-tepui, sector centro-meridional, 2,630 m, 29 Apr. 1984, *Huber 9498* (MYF, VDB); cumbre sur-occidental del Ilú-tepui, 2,700 m, 18 June 1985, *Huber & Alarcon 10602* (MYF, VDB); altiplanicie del Uei-tepui (Cerro del Sol), sector occidental por encima del valle del Río Arabopo, 2,150 m, 22 Jan. 1985, *Huber 10022* (MYF, VDB); Cerro Roraima: cumbre, parte noreste de

Venezuela inmediata al sur del hito que marca los limites con Guyana, Brasil y Venezuela, 2,750–2,800 m, 26 Aug.–2 Sep. 1976, *Steyermark et al. 112566* (MO, NY, US, VEN), *112648* (K, MO, NY, US, VEN).

The affinities of this low plant of high-altitude tepuis are definitely with *X. hymenachne* C. Martius, which is frequent in the surrounding lower-elevation savannas of the Gran Sabana. However, the leaves are harder, their bases more orbicularly dilated; the spike bracts are more folded and more acuminate; and the seeds are somewhat longer.

34. Xyris hymenachne C. Martius, Flora 24(2): 55. 1841. TYPE: Brazil: "Prov. Minarum, Mart. Hb. 872" (lectotype, BR; isolectotypes, L, M; phototypes, F, NY). Figure 34.

X. arescens Kunth, Enum. Pl. 4: 3. 1843.

X. submontana Gleason, Bull. Torrey Bot. Club 56: 393. 1929. TYPE: Brazil. Río Branco: Mt. Roraima, Philipp Swamp, 5,100–5,200 ft., 11 Nov. 1927, *G. H. H. Tate 334* (K).

Solitary or cespitose, often bulbous-based, slender perennial mostly 2–6 dm high, the stems contracted. Principal leaves ascending or spreading flabellately, 0.5–2 dm long; sheaths entire or sparsely brown ciliate at dilated base, dull brown or stramineous, at very base sometimes castaneous and abruptly orbicular-dilated, ½ or more as long as blades, tapering above gradually to blade, usually eligulate, the blades flat, straight or twisted, strongly compressed, 1.5–4 mm wide, acute to long-acuminate, the margins with edges thin or slightly thickened, smooth, papillate or ciliolate, the surface smooth to papillose-rugulose, finely nerved, dull green. Scape sheaths slightly to much shorter than leaves, tubular and sharply costate below, above open, strongly keeled, short-bladed. Scapes narrowly lineal, twisted, sometimes flexuous, distally subterete, 0.6–0.7 mm thick, mostly unicostate (sometimes multicostate), the costae low but distinct, smooth to papillate or ciliolate. Spikes obovoid to subglobose, 5–8 mm long, attenuate, dull pale red-brown, of several loosely spirally imbricate bracts, these rounded-convex, often medially low-ribbed, without distinct dorsal area, with erect, broad, pale, scarious-lacerate borders; sterile bracts slightly smaller than fertile bracts but lowest over ½ as long as spike, ecarinate, the inner sterile and lower fertile bracts obovate or broadly oblong, 7–8 mm long, the backs often papillate. Lateral sepals free, very inequilateral, oblong-curvate, 4–6 mm long, obtuse, the darker keel fimbriociliate or ciliate at least from middle to apex. Petal blades obovate, ca. 5 mm long, the apex narrowly rounded, the margins wavy. Staminodia bibrachiate, the broad, thin branches each tipped by a few penicillate hairs. Anthers lanceolaate, ca. 1.5 mm long, deeply bifid and sagittate, on filaments ca. 0.5 mm long. Capsule ellipsoid to broadly obovoid, ca. 4 mm long, the valves without septa, the placentation basal. Seeds cylindric-fusiform or narrowly ellipsoid, on long funicles, 0.6–0.7 mm long, apiculate, amber, longitudinally conspicuously multi-ribbed.

Distribution. Moist to wet, medium- to high-elevation savanna, South America east of the Andes, in northern South America, Colombia east into Guyana.

Selected Venezuelan specimens. T. F. AMAZONAS: Dto. Río Negro, seeps along Río Mawarinuma, just above Neblina expedition base camp, 26 Nov. 1984, *Kral 71823* (VEN, and to be distributed); same area, 2 km above Neblina base camp, 3 Dec. 1984, *Kral 71937* (VEN, and to be distributed); Neblina, rocky places along Caño Grande at 1,100 m, 24 Nov. 1957, *Maguire & Wurdack 42200A* (NY, US). BOLÍVAR: carretera El Dorado–La Gran Sabana, alrededores de km 132, ca. 1,200 m, 21 Feb. 1968, *Bunting 3050*, identified as *X. submontana* Gl. (US); hacia el Salto Aponwao, 1,200 m, 7 Mar. 1983, *Huber & Entralgo 7408* (MYF, VDB, VEN); several numbers by *Kral* along El Dorado–Sta. Elena Highway (Ven. 10) through the Gran Sabana (numbers *70305, 70326, 70367, 70392, 70413, 70447, 70467, 70515, 70559, 70591, 70620, 70628*, collected 22–29 July 1983, and with general distribution to include F, K, MO, NY, SP, U, US, VEN, VDB, etc.), subsequently *72004, 72061*, from the same area on 13 & 14 Dec. 1984 (MYF, VEN, and to be distributed); 17 km E of El Pauji, 64 km W of Sta. Elena, Río Las Ahallas, 30 Oct. 1985, *Liesner 19164* (MO, VDB, VEN); en selvas a orillas del Río Uairen, alto Caronia, 25 Apr. 1946, *Lasser 1712* (NY); Uiapan-tepui, 1,900 m, 1–15 Feb. 1948, *Phelps & Hitchcock 376* (NY); headwaters of Río Cuyuni, NE of Luepa, 1,300 m, 23 Apr. 1960, *Steyermark & Nilsson 492* (NY, VEN); dripping rocks at base of Ptari-tepui, 4 Nov. 1944, *Steyermark 59841* (F, US, VEN); Auyan-tepui, div. occidental del cerro, vic. "Rio Lomita Camp,"

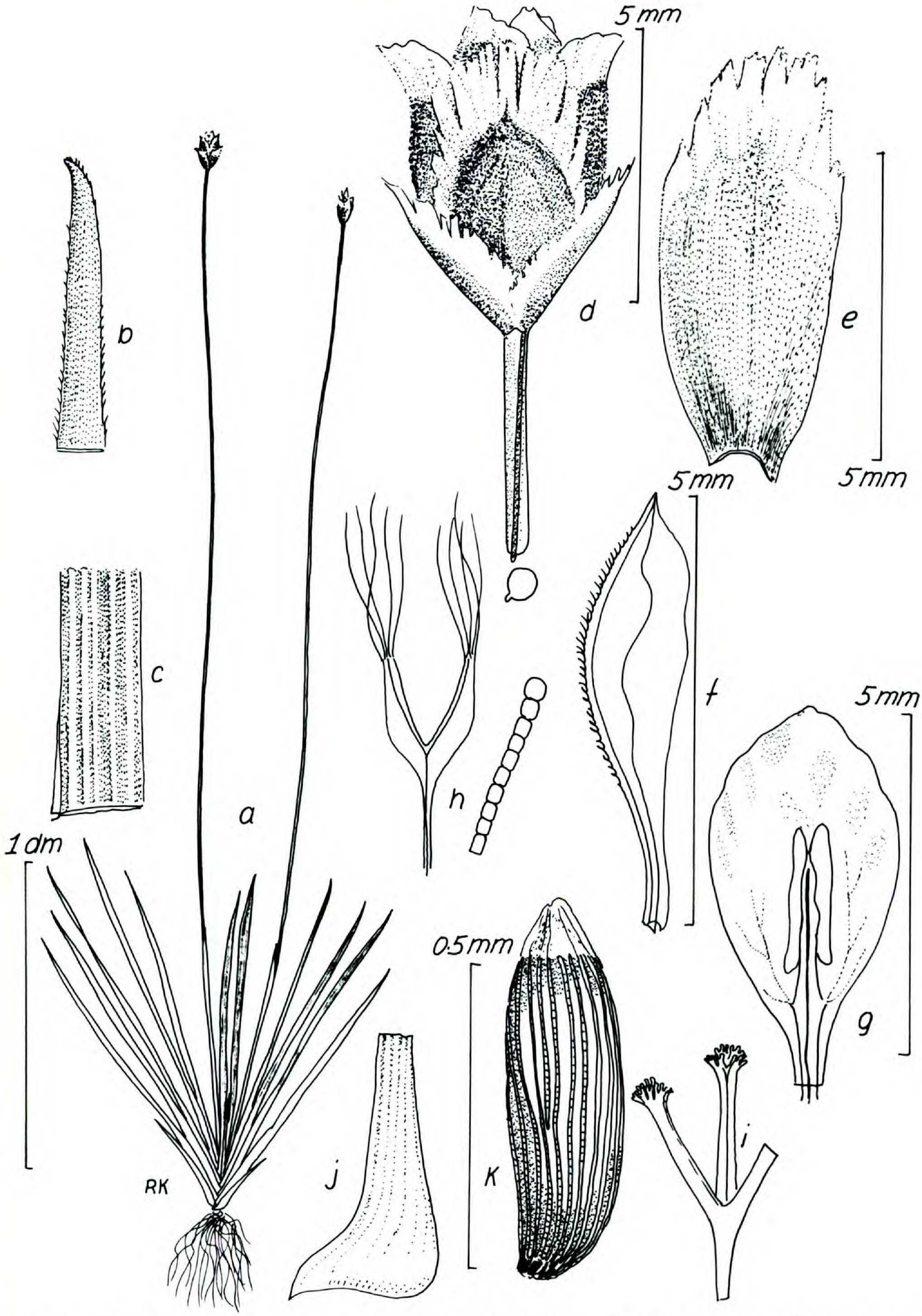


FIGURE 34. Xyris hymenachne *(*Steyermark 93465, Kral 70326*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Spike.—e. Fertile bract.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Leaf base.—k. Seed.*

1,800 m, 7 May 1964, *Steyermark 93465* (K, NY, VDB, US).

This species, while very highly variable in stature and leaf, is distinguished primarily by the very broad, pale, scarious bract borders and the absence of a dorsal area. The leaf bases range from strongly dilated to indistinctly so, and the numbers of flowers and bracts in a spike vary widely. A perfect range of intermediates connects this to *X. submontana* Gleason, a not uncommon morphology in the Gran Sabana of Estado Bolívar, Venezuela. This last was supposed to be distinguishable on a basis of its comparative smoothness, the depressed-globose spikes, and the granular-papillose spike bracts. The species unfolds its blooms in morning. It is one of the weedier species, often coming in abundantly on moist to wet, nearly totally mineral substrates.

35. Xyris decussata Gleason, Bull. Torrey Bot. Club 56: 392. 1929. TYPE: Venezuela. Bolívar: Mt. Roraima, summit, 26 Nov. 1927, *G. H. H. Tate 427* (lectotype, NY). Figure 35.

Robust but low, cespitose, thick-based perennial 1.5–4.3 dm high, the stems stout and contracted or to 5(–15) cm long, ascending. Leaves rigid, spreading flabellately, 1–2 dm long; sheaths firm, entire, about as long as blades, castaneous, tapering gradually from broad base, apically with a short, often salient, small, narrowly triangular ligule; blades broadly linear, flat, 3–5 mm wide, abruptly broadly rounded at apex, the margin completely and densely rusty ciliate with hairs arising from a dark brown, incrassate border, the surfaces green, finely nerved, smooth. Scape sheaths shorter than leaves, tubular-carinate, the keel ciliate, alate, terminating in a very short, blunt, ciliate blade. Scapes straight, slightly twisted, distally flattened, 2–3 mm wide, bicostate, the costae densely rusty ciliate. Spikes subglobose or depressed-globose to obovoid, ca. 1 cm long, dark brown, of many, firm but loosely appressed bracts without distinct dorsal areas, usually in nearly vertical ranks; sterile bracts several, the lower ones triangular, much shorter than the fertile bracts and grading gradually into them, the fertile bracts ovate or broadly oblong, ca. 6 mm long, apically broadly to narrowly rounded and subentire, the backs ecarinate, slightly convex-rounded. Lateral sepals free, subequilateral, ca. 6 mm long, linear-oblanceolate, obtuse or broadly acute, dark brown, the firm dark keel entire or ciliate or ciliato-lacerate toward apex. Petal blades elliptic, ca. 5 mm long, yellow, the apex broadly and bluntly acute or narrowly rounded, the margin wavy. Staminodia 4-brachiate, the branches long-penicillate. Anthers oblong, 1.5–1.7 mm long, cleft to below the middle, sagittate, on filaments nearly 2 mm long. Capsules ellipsoid, 4–5 mm long, placentation basal-central, the valves with low septa. Seeds numerous, narrowly cylindric-oblanciform, ca. 1.5–1.7 mm long, including a pale, narrowly conic apiculus ca. 0.3 mm long (loose outer integument), the body pale reddish brown, translucent, finely but distinctly longitudinally ribbed.

Distribution. High-elevation tepuis, in boggy savanna, over 2,000 meters, southeastern and southern Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: Cumbre del Ilu-(Uru-)tepui, sector centro-meridional, 2,630 m, 29 Apr. 1984, *Huber 9509* (MYF, VDB); cumbre del Tramen-tepui, la porción mas noroccidental del Macizo del Ilu-(Uru-)tepui, 2,650 m, 23 Jan. 1985, *Huber 10053* (MYF, VDB); Ilu-tepui, Gran Sabana, wet places in open low bush, Mesa Ridge, 6,000 ft., 13 Mar. 1952, *Maguire 33408* (NY)—this is the tallest example on record, with leaf tips more as in *X. albescens*; summit Mt. Roraima, NW portion N and NW of Summit Camp, 2,620–2,720 m, 27 Sep. 1944, *Steyermark 58806* (F, NY, US, VEN); Chimantá Massif, upper mossy slopes, NW part summit of Abacapa-tepui, above first line of sandstone bluffs, *Steyermark 74998* (C); Cerro Roraima: cumbre parte NE de Venezuela immediata al sur del hito que marca los limites con Guyana, Brazil, and Venezuela, 2,750–2,800 m, 26 Aug.–2 Sep. 1976, *Steyermark et al. 112618* (VEN); Cumbre de Auyan-tepui, cerca de las orillas del sector oriental, al norte de la Misión de Camarata, 1,940 m, 27 Feb. 1978, *Steyermark et al. 116115* (VEN).

This endemic is vegetatively a stubby version of *X. bicephala* Gl., but even a first

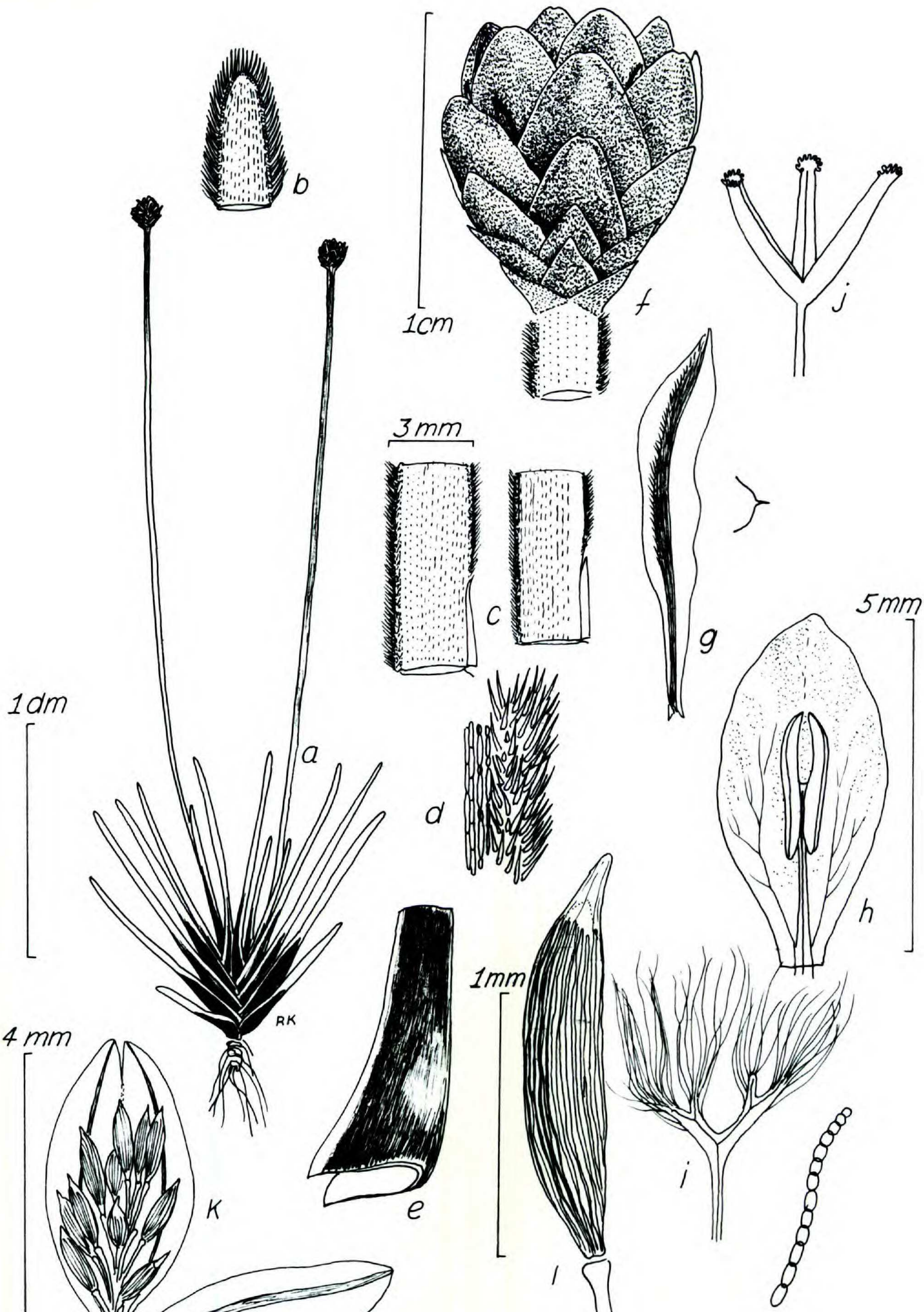


FIGURE 35. Xyris decussata *(from the type, except for flower).—a. Habit sketch.—b. Leaf tip.—c. Two samples of leaf-sheath junction.—d. Enlarged sector of edge of leaf blade.—e. Leaf base.—f. Spike, upper scape.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode and enlarged tip of beard hair.—j. Stylar apex.—k. Capsule, showing placentation; one valve removed.—l. Seed.*

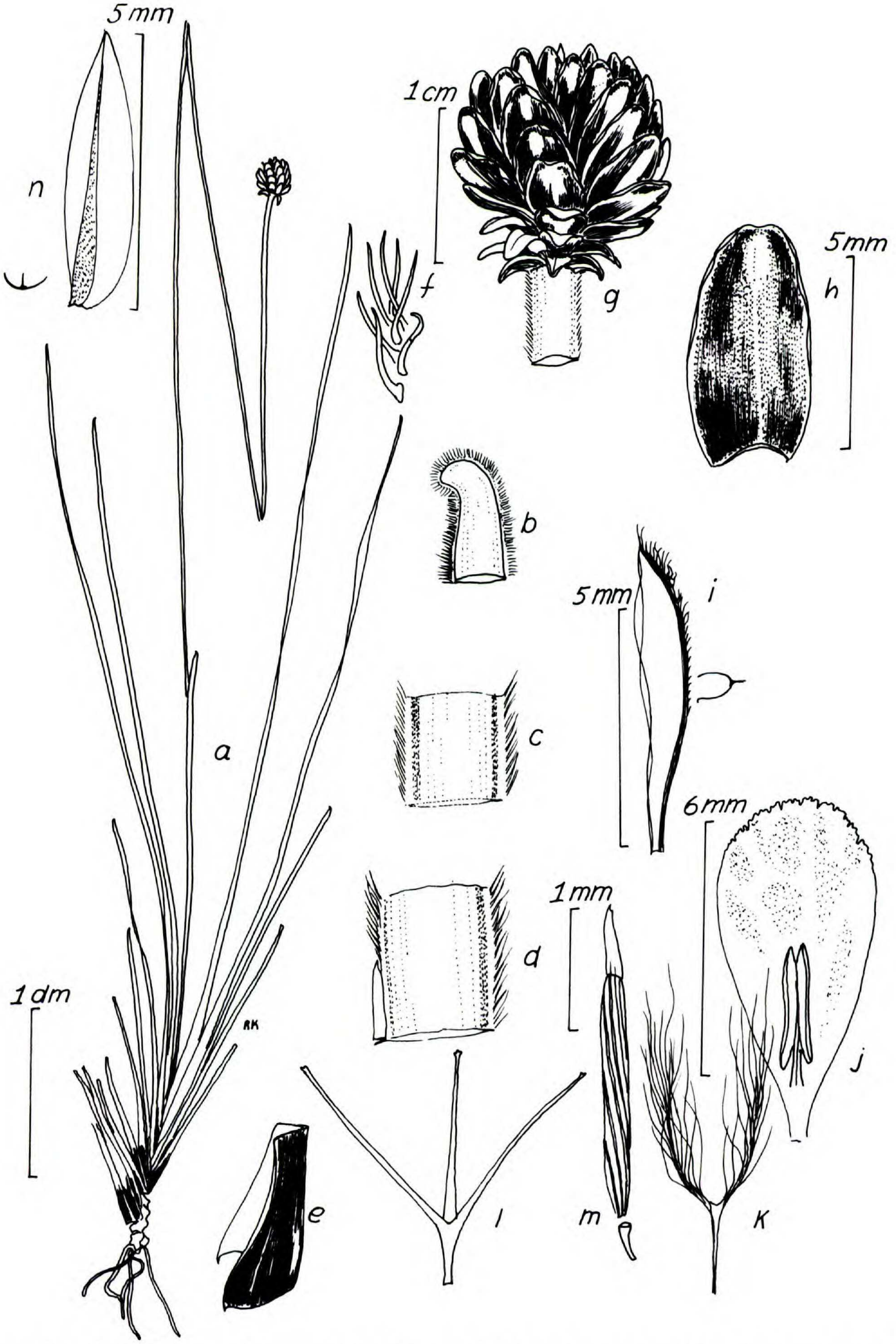


FIGURE 36. Xyris albescens (Steyermark 59734).—*a. Habit sketch.—b. Leaf tip.—c. Sector of leaf, mid-blade.—d. Leaf blade at junction with sheath.—e. Leaf base.—f. Trichomes from edge of leaf blade (much enlarged).—g. Spike.—h. Fertile bract.—i. Lateral sepal.—j. Petal blade and stamen.—k. Staminode.—l. Style branches.—m. Seed.—n. Capsule, valve removed, showing septum (shaded).*

glance reveals the distinctive dense fringe of rust-colored hairs marginally on the leaf blade. Taller material with more lustrous bracts and longer leaves but having such ciliation has been obtained from Chimantá, Ptari-tepui, and Ilu-tepui. This material appears to be from populations "influenced" by other species such as *X. albescens* Steyerm., or is identified as *X. melanovaginata* Kral & Smith.

36. Xyris albescens Steyerm., Fieldiana Bot. 28(1): 105, fig. 16a, b. 1951. TYPE: Venezuela. Bolívar: Ptari-tepui, *Bonnetia roraimae* forest on southwest-facing shoulder, 2,000–2,200 m, 2 Nov. 1944, *J. A. Steyermark 59734* (holotype, F; isotypes, GH, NY, US). Figure 36.

Robust, cespitose perennial (3.5–)4–10 cm high, the stems short, stout, ascending. Leaves elongate-linear, 2–6 dm long, mostly spreading or ascending; sheaths at least ½ as long as blades, keeled, firm, lustrous, deep red-brown or castaneous, the margins entire, tapering evenly from base to a small, indistinct ligule; blades evenly linear, flat and strongly flattened, pale green, (3–)5–6 mm wide, with apices asymmetrically narrowly acute or (in type) incurved and narrowly rounded, the edges densely white- (rarely pale red-brown-) ciliate, sometimes with a submarginal brown or red border. Scape sheaths much shorter than leaves, short- to elongate-bladed, the blades as in leaves. Scape pale green, distally broad and flattened (2–)2.5–3 mm wide, the edges densely pale ciliate as in leaf blades. Spike broadly ovoid, globose or hemispheric, (1–)1.5 cm long, blunt, rich, lustrous brown or castaneous, multiflowered; sterile bracts very many, triangular-ovate, the lowermost small, often squarrose, grading larger into the fertile bracts, these narrowly ovate to oblong, firm, 6–9 mm long, apically rounded, entire, sometimes somewhat cucullate, the dorsal area absent or inconspicuous, the backs rounded-convex, ecarinate. Lateral sepals equilateral, oblong-linear to linear-oblanceolate, mostly acute, 6–7 mm long, pale except for dark, scabro-ciliate to villosulous keel. Petal blades narrowly obovate, ca. 6–7 mm long, yellow, apically broadly rounded, erose. Staminodia bibrachiate, the slender branches long-penicillate from base to tip. Anthers lanceolate, ca. 2.5 mm long, apically deeply retuse, basally sagittate, on filaments ca. 1 mm long. Capsule narrowly ellipsoid, ca. 5 mm long, the valves deeply septate at base, placentation appearing central but axile at base. Seeds narrowly fusiform-cylindric, 2–3 mm long, pale brown, including a white, triangular-linear scale 0.5–0.7 mm long, the fruit body spirally coarsely parallel-ribbed.

Distribution. Moist to rather dry rocky savanna, high elevations of tepuis, southern Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: Cima del Roraima, Jan. 1977, *Delascio & Brewer-Carias 4802* (VEN); en el paso entre Ptari-tepui y Sororopan-tepui, al N de Kavanayen, 1,370 m, 28 June 1983, *Huber & Alarcon 7725* (NY); Cumbre del Yuruani-tepui, ca. 12 km al NNE del Kukenan-tepui, 29 Feb. 1984, *Huber 9088* (MYF, VDB); Cumbre del Yuruani-tepui, al NNW del Cerro Kukenan, 27 Apr. 1984, *Huber 9414* (MYF, VDB); Kukenan-tepui, cumbre del sector mas septentrional, algo separado del macizo principal, 2,500 m, 28 Apr. 1984, *Huber 9446* (MYF, VDB); Ptari-tepui, vic. "Cave Rock" Camp below southern face of mountain, 1,600–2,000 m, 14–19 Aug. 1970, *Moore et al. 9817* (NY, US); Mt. Roraima, escarpment, 7,600 ft., 1 Nov. 1973, *R. Persaud 149* (K); vic. rd. campamento 150 at km 150 in valley of savanna of Río Urarama below Urarama-tepui, NE of Luepa, 1,220 m, 24–25 Apr. 1960, *Steyermark & Nilsson 641* (NY, VEN); Ptari-tepui, dry sandy and rocky sandstone exposures on plateau portion of southeast-facing slopes, 1,600 m, 1 Nov. 1944, *Steyermark 59683* (F, NY); Chimantá Massif, elfin forest on plateau of southeast-facing upper shoulder of Apacará-tepui, 2,000 m, 19 June 1953, *Steyermark 75757* (F, NY, VEN); Meseta del Jaua, el Este del trib. del Río Marajano, 1,800 m, 26 Feb. 1974, *Steyermark et al. 109558* (F, K, US, VEN)—this differs from all other specimens in its longer spikes to ca. 2 cm; Macizo del Chimantá, altiplanicie en la base meridional de los farallones superiores del Apacará-tepui, sector norte del Macizo, 2,200 m, *Steyermark et al. 128393* (VEN, VDB).

Material of this from Guyana, Upper Mazaruni District, north slope of Mt. Roraima, alt. 2,000–2,300 m, 16 Feb. 1985, *J. Renz 14266*, was lent by U. Other material with affinities, lent by NY, from T. F. Amazonas of Venezuela is Cerro Marahuaca, 2,500 m, 16 Feb. 1981, *Steyermark 124439*.

37. Xyris fuliginea Kral & Lyman B. Smith, sp. nov. TYPE: Venezuela. T. F. Amazonas: Dept. Atabapo, Cerro Marahuaca—FHUIF Cumbre, zona boscosa en la falda este del riachuelo, 2,480–2,500 m, 3°35′N, 65°20′W, 1–2 Feb. 1982, *J. Steyermark, M. Guariglia, N. Holmgren, J. Luteyn & S. Mori 125978* (holotype, VEN; isotype, VDB). Figure 37.

Planta perennis caespitosa, rigida, 3–5.6 dm alta. Radices graciles. Caules breves aut usque ad 5 cm longi. Folia principalia vulgo flabellate expansa, 1.5–3 dm longa, vaginis scaporum parum longiora; laminae vaginas aequantes vel eis leviter aut 1–2-plo breviores, linearotriangulatae, planae, compressae, 3–5 mm latae, olivaceae, glabrae; apices gradatim contracti, acuti, leviter incrassati; margines tenues, subtiliter dense albociliati vel albociliolati; vaginae carinatae, atrocastaneae, nitidae, integrae, ad basin dilatae, in laminas gradatim decrescentes, eligulatae. Vaginae scaporum prope basem castaneae, teretes, tortae, multicostatae, apicem versus apertae, carinatae, laminis brevibus. Scapi apicem versus ancipiti, ca. 2–2.5 mm lati, albociliati, olivacei. Spicae multiflorae, obovoideae, 1–1.5 cm longae, obtusae. Bracteae erectae, subdecussatae vel laxe spiraliter imbricatae, firmae, ecarinatae, fuligineae, sine area dorsali, integrae tum laceratae; bracteae steriles plures, triangulato-ovatae, pari infimo valde carinato, carinis ciliatis, anguste acuto, ca. 3-plo spica brevius, paribus intimis fertilibus breviores, in fertiles gradatim transientes; bracteae fertiles latae oblongae vel oblongo-lanceolatae, 7–9 mm longae, late acutae vel anguste rotundatae. Sepala lateralia libera, subaequilatera, ca. 7–8 mm longa, atroferruginea, leviter curvata, late acuta; ala carinali lata, a medio ad apicem rufociliata. Laminae petalorum late obovatae, 5.5–6 mm longae, luteolae, apice late rotundatae, erosae. Staminodia bibrachiata, brachiis longipenicillatis. Antherae lanceolatae, ca. 2 mm longae, profunde emarginatae et sagittatae; filiis latis, ca. 1 mm longis. Capsula ellipsoidea, 5 mm longa, placentae centralis sed valvis capsulae ad basim profunde septatis, sic placentio subaxilis. Semina numerosa, anguste ellipsoidea vel anguste claviformes, ca. 1.5 mm longa, longitudine prominente spiraliter multicostata, conicam pallidam squamellam ca. 0.5 mm longam includens.

Stiff tufted perennial 3–5.5 dm high. Roots slender, fibrous. Stems short or up to 5 cm long. Principal foliage leaves commonly spreading flabellately, 1.5–3 dm long, slightly longer than the scape sheaths; blades equal to sheaths or to ½–⅔ as long, linear-triangular, level, flattened, 3–5 mm wide, olivaceous, smooth; apices gradually narrowed, acute, slightly thickened at tips; margins thin, finely densely white ciliolate or white ciliate; sheaths carinate, deep-castaneous, shining, entire, dilated at base, narrowing gradually into blades, eligulate. Sheaths of scapes castaneous toward base, terete, twisted, multicostate, opening toward apex, carinate, with short blades. Scape ancipital toward apex, ca. 2–2.5 mm wide, white-ciliate, olivaceous. Spikes multiflorous, obovoid, 1–1.5 cm long, obtuse. Bracts erect, subdecussate to loosely spirally imbricate, firm, ecarinate, fuligineous (charcoal brown), without dorsal area, entire, lacerate; sterile bracts several, triangular-ovate, the lowest pair strongly carinate, carinae ciliate, narrowly acute, ca. 3 times shorter than the spike, the inner pairs shorter than the fertile pairs, grading into them; fertile bracts broadly oblong to oblong-lanceolate, 7–9 mm long, broadly acute to narrowly rounded. Lateral sepals free, subequilateral, ca. 7–8 mm long, deep red-brown, slightly curvate, broadly acute; keel broad, red ciliate from middle to apex. Petal blades broadly obovate, 5.5–6 mm long, yellow, broadly rounded apically, erose. Staminodia bibrachiate, the branches long-penicillate. Anthers lanceolate, ca. 2 mm long, deeply emarginate and sagittate on broad filaments ca. 1 mm long. Capsule ellipsoid, 5 mm long, the placentae central but the capsule valves deeply septate toward base, thus the placentation subaxile. Seeds numerous, narrowly ellipsoid to narrowly claviform, ca. 1.5 mm long, longitudinally spirally prominently ribbed, and including a pale, conical scale ca. 0.5 mm long.

Distribution. Confined to the Cerro Marahuaca, wet high altitude, rocky savanna, elevation over 2,000 m, T. F. Amazonas, Venezuela.

Paratypes. Summit, northeast, headwaters of small stream, 2,500 m, 16 Feb. 1981, *Steyermark et al. 124439* (MO, NY, VDB, VEN); same locality, date, and collectors as type, *Steyermark et al. 125991, 125993* (VEN), *126018* (VDB, VEN); extremo noreste, 3°50′N, 65°28′W, 2,580–2,600 m, 30 Mar.–1 Apr. 1983, *Steyermark & Delascio 129224* (VDB, VEN); cumbre parte central de la Meseta Sur-Este, a lo largo de la Quebrada Yekuana, afluente del Río Negro, 2,560 m, 10–12 Oct. 1983, *Steyermark 129470* (VDB, VEN).

This species has been more of a problem than most in that it appears to be a meld of

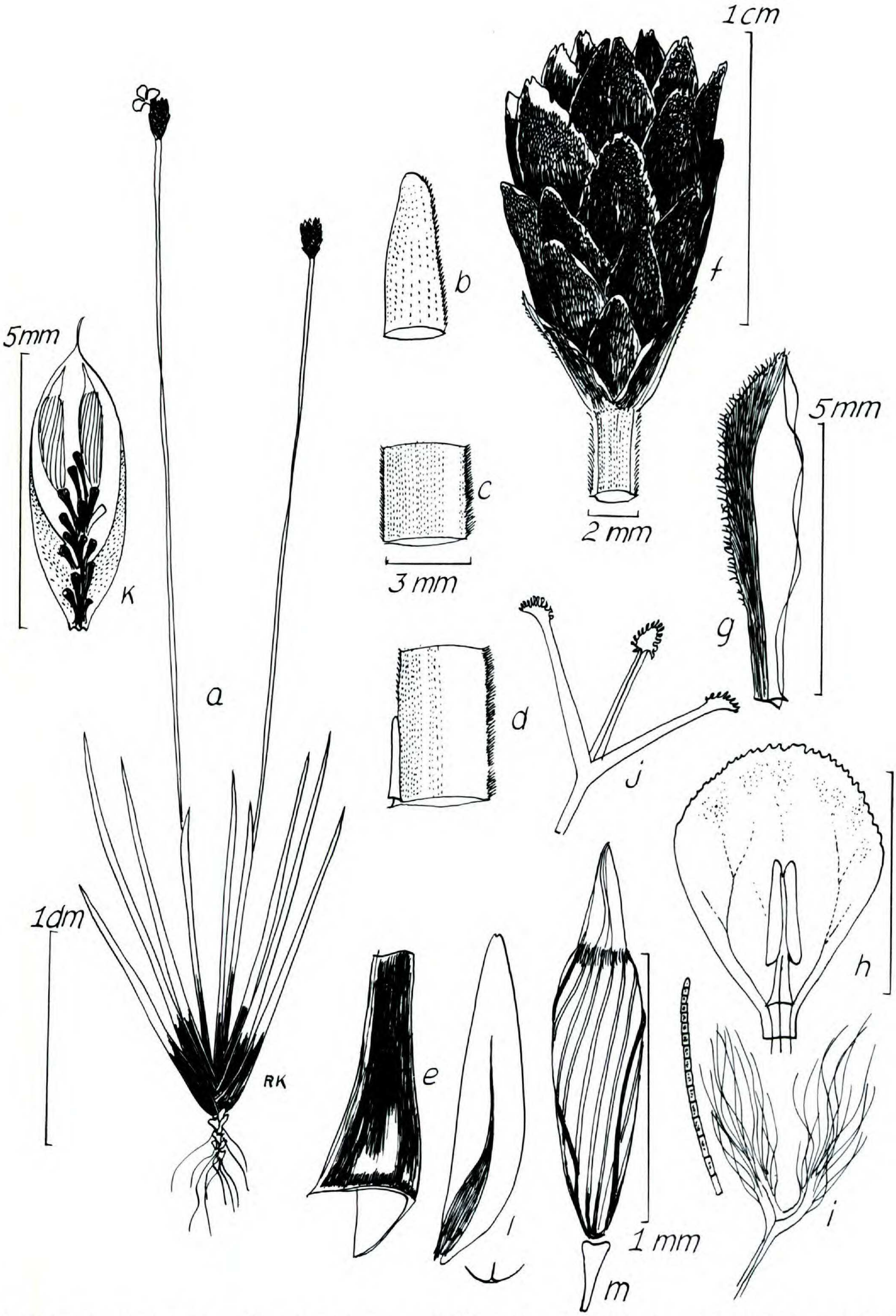


FIGURE 37. Xyris fuliginea *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade, midsector.—d. Leaf blade–sheath junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair.—j. Stylar apex.—k. Capsule, ideal longisection showing two septa (stippled), placentae, two seeds.—l. Capsule valve showing septum (dark shading).—m. Seed.*

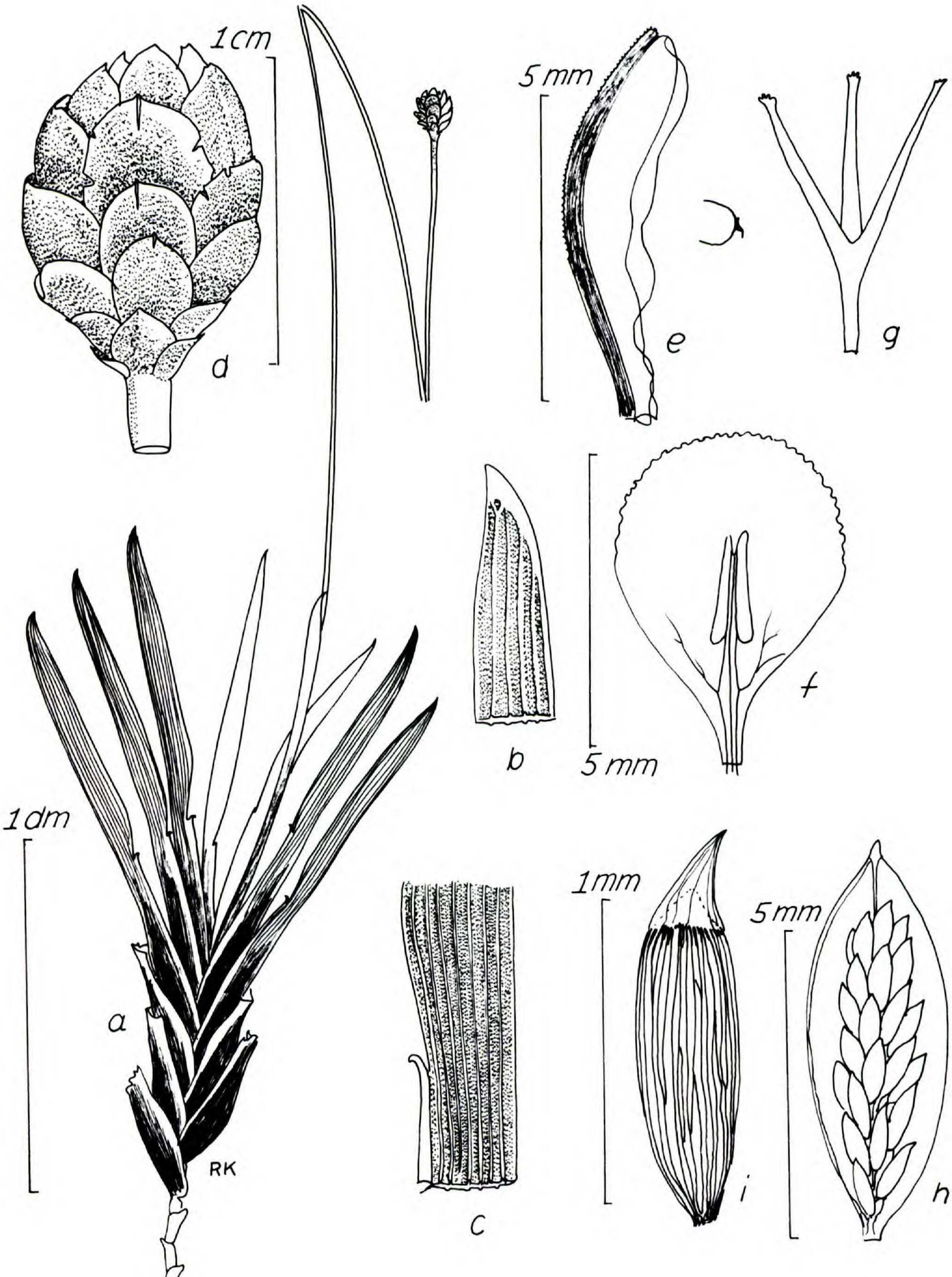


FIGURE 38A. Xyris ptariana *(*Steyermark 105124, *except lateral sepal and stylar apex from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Spike.—e. Lateral sepal.—f. Petal blade, stamen.—g. Stylar apex.—h. Capsule.—i. Seed.*

three other high-country species: *X. albescens* (ancipital scape, white-ciliate leaf and scape edges), *X. culmenicola* (obovoid, sooty brown spikes, ciliate, linear-triangular leaf blades), and *X. lugubris* (similar bract, spike and leaf characters). Yet the uniformity of the now rather large set of samples from Cerro Marahuaca collected by Steyermark and oth-

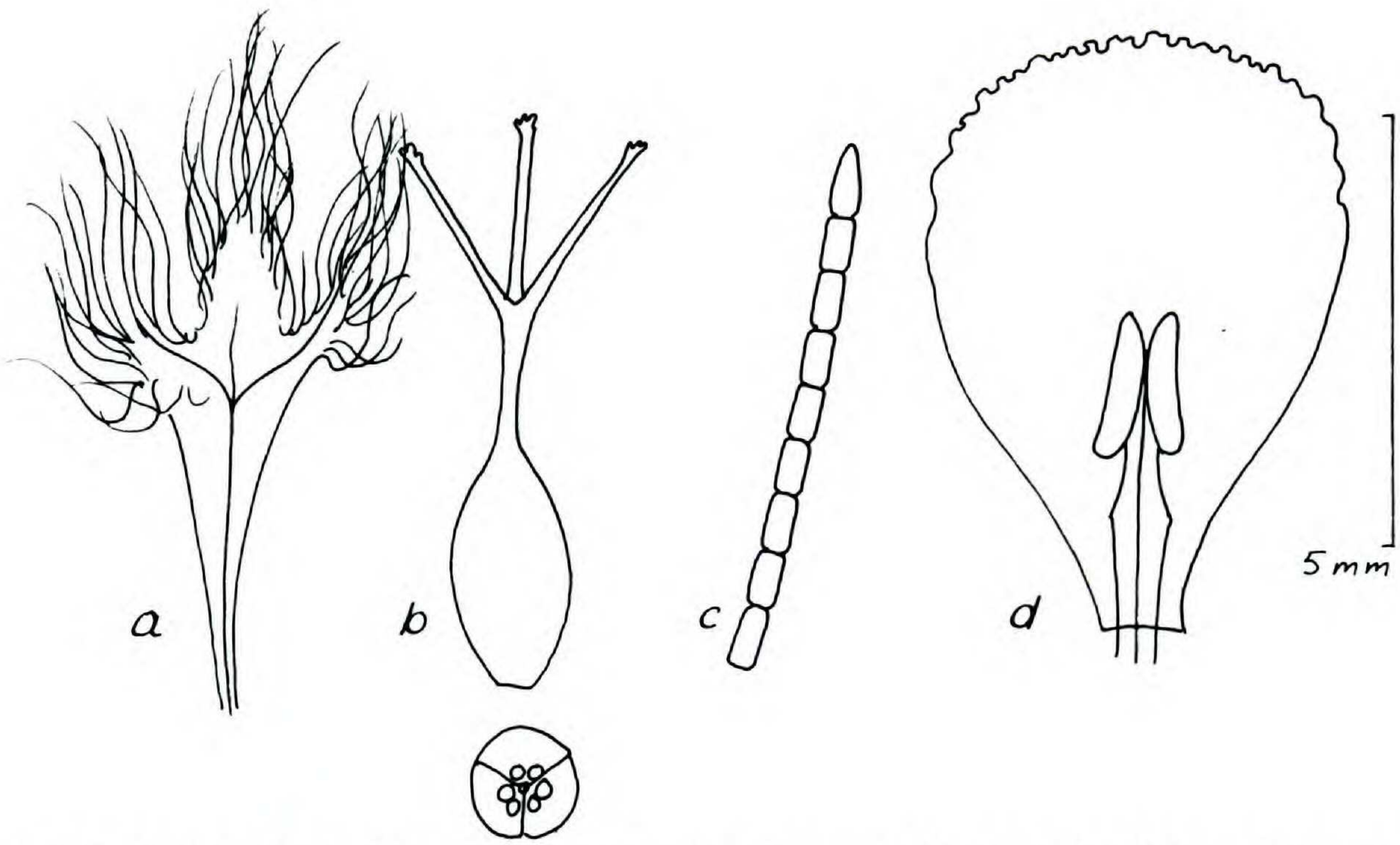


FIGURE 38B. Xyris ptariana *(from the type).—a. Staminode.—b. Ovary and style branches; cross section below.—c. Enlarged staminodial beard hair tip.—d. Petal blade, stamen.*

ers makes description of this cryptic morphology necessary.

38. Xyris ptariana Steyerm., Fieldiana, Bot. 28(1): 110, fig. 16I, J. 1951. TYPE: Venezuela. Bolívar: forming dense tufts, wet bluffs, 2,000 m, Ptari-tepui, Gran Sabana, *Steyermark 59919* (holotype, F; isotypes, F, NY, US, VEN). Figure 38A, B.

Robust, densely cespitose, usually smooth, perennial to 1 m high, the stems elongate, branching from the base and rebranching, the ultimate branches forming frondlike plates of leaves. Leaves spreading-ascending, 1.5–3.5 dm long; sheaths mostly deep red-brown, sometimes pale brown, nearly as long as blades or longer, entire-edged, strongly keeled, narrowing evenly from the dilated base to the blades, there producing a triangular, scarious, spreading or recurved-tipped ligule to 3 mm long; blades flat, straight, linear-ensiform, (3–)3.5–12 mm wide, the apex incurved-acute, flat, the margins usually entire (on Abacapa-tepui densely red ciliate) or papillose-tuberculate, the base narrowed ca. 2–3 cm from ligule on ventral side, the surfaces deep green, strongly multinerved. Scape sheaths shorter than leaves, proximally tubular and multicostate, lustrous brown, distally opening, strongly keeled, with a short blade. Scapes slender but stiff, straight or slightly flexuous and slightly twisted, distally flattened or in cross section narrowly ovate or elliptic, sometimes ancipital, 1.5–3 mm wide, the costa(e) 1–2, usually making up edges, smooth to tuberculate-scabrid or (on Abaca-tepui) red ciliate. Spikes ellipsoid to broadly obovoid, 1–1.5(–2) cm long, blunt, pale brown or olivaceous brown to reddish brown, of many spirally imbricate, thinnish bracts without dorsal areas, the lowest sterile bracts much smaller than the fertile bracts, ovate, obtuse-angled to acute, slightly keeled, grading into the larger, flatter fertile bracts, these obovate-oblong, 0.8–1 cm long, the apex broadly rounded, entire to erose, the backs but slightly convex, toward apex often with a low, lustrous costa. Lateral sepals free, subinequilateral, oblanceolate or spathulate, 6–8 mm long, blunt, thin, with a broad, darker, entire to ciliolate keel. Petal blades broadly obovate to suborbicular, 6–7 mm long, yellow, the broadly rounded apex erose. Staminodia clavate-trilobate when present (in the type), distally densely long-penicillate. Anthers lance-oblong, 1–2 mm long, deeply bifid

and sagittate, on filaments 1–1.5 mm long. Capsule ellipsoid, ca. 6–7 mm long, the placentation appearing free-central but the 3 valves with strong, deep septa reaching the capsule axis, thus placentation actually axile. Seeds very numerous, asymmetrically ellipsoid, 1–1.5 mm long, pale amber with a pale, narrowly conic apical scale, longitudinally finely but distinctly ribbed.

Distribution. Boggy, seepy, rocky areas of savanna, at elevations of 1,300 meters or more, Territorio Federal Amazonas and Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Cerro Sipapo (Paraque) common in bogs about pool, Caño Negro savannas at 1,400 m, 15 Dec. 1948, *Maguire & Politi 27703* (GH, K, US, VEN)—very large material as to plant height, leaf width, spike, etc.; summit, Cerro Marahuaca, 2,685 m, 15 Jan. 1981, *Maguire 65634* (NY); Cerro Sipapo, wet cliffs below escarpment, 1,300 m, frequent, Dec. 1948, *Maguire & Politi 27498* (F, NY, US); Cerro Paraque, 1,800 m, Feb. 1946, *Phelps 47* (US); summit of Cerro Duida, on high moist ridgetop, 1,820–2,075 m, 4 Sep. 1944, *Steyermark 58350* (F); Cumbre del Cerro Autana: sabana y afloramientos expuestos, 1,230–1,240 m, 20–22 Sep. 1971, *Steyermark 105124* (F, MO, US); summit of Mount Duida, 5,500–6,000 ft., 26 Nov.–16 Dec. 1927 *G. H. H. Tate 417* (NY)—this with scape broader than norm. BOLÍVAR: Cerro Apacara, 2,300 m, Río Caroni, 11 Nov. 1946, *F. Cardona 1942* (US); Cumbre del Aprada-tepui, sector sur, ubicado ca. 30 km al E de Uriman, 2,500 m, 30 June 1984, *Huber 9565* (MYF, VDB); Chimantá Massif, NW part of summit of Abacapa-tepui, above first line of sandstone bluffs, 2,125–2,300 m, 14 Apr. 1953, *Steyermark 74998*—this material with red-bordered scapes and leaf blades (F, NY, VEN).

This species may be a complex of varieties held together by a combination of elongate and elongate-branched axes producing frondlike plates of leaves, by the curious ligule, and by the distinctive, indented ventral margin of leaf blade just above the sheath. At one end of the variation is the type, narrowest example of *X. ptariana* in leaf and scape, and which differs the least from *X. witsenioides* F. Oliver. At the other extreme, to the far west in Territorio Federal Amazonas, is *X. xiphophylla* Maguire & Lyman B. Smith. Several summit elevations in Estado Bolívar and some in Amazonas are now known to have this taxon, and populations on each are distinguishable, yet not sufficiently to allow a specific treatment.

39. Xyris witsenioides F. Oliver, Thurn, Timehri 5: 207. 1886; Trans. Linn. Soc. II. 2: 285, pl. 50, figs. 9–15. TYPE: "British Guiana, Roraima, ledge 7,300 ft.," *Everard F. im Thurn*, 14 Dec. 1884 (lectotype, K). Figure 39A, B.

Densely cespitose, multibranched perennial (1.2–)2–6 dm tall, the primary branches elongate, ascending, rebranching to form frondlike plates of leaves, the whole producing large dome-shaped masses with bases buried in substrate. Leaves ascending, rarely spreading, 5–20 cm long; sheaths eciliate, the bases tightly imbricate, distichous on the elongate stems, castaneous or light brown, often persistent long after blades, fully as long as blades, strongly keeled, narrowing gradually to scarious, triangular, erect ligules 1–2 mm long; blades gladiate-linear, flattened, straight or falciform, 1–3(–4) mm wide, gradually narrowing from just below middle to apex, there incurved-acute or erect-acute, slightly thickened; margins thin, smooth or scaberulous-papillate, rarely ciliolate; surfaces yellow-green, smooth, finely but evidently multinerved. Scape sheaths shorter than leaves, closed at base, ciliate-keeled, multicostate, above with short, erect, ciliate blades. Scapes straight or flexuous, distally subterete to slightly compressed and oval or narrowly oblong-elliptic in cross section, 0.7–1 mm wide, ecostate or 1(–2 or more) costate, the costae smooth, scaberulous or rarely ciliolate, the surfaces otherwise smooth. Spikes ellipsoid to obovoid, drying broader, 0.7–1.4 cm long, olive-brown or red-brown, of loosely spirally imbricate thin bracts without evident dorsal areas; sterile bracts several, the lowest much smaller and narrower than the fertile bracts, these oblong to obovate, shallowly convex, low-carinate toward apex, 5–7 mm long, rounded, entire, aging lacerate. Lateral sepals free, subequilateral, ca. 5–7 mm long, oblong-curvate, obtuse, the broad thin keel subentire to ciliate, aging lacerate. Petal blades broadly obovate to suborbicular, yellow, 5–6 mm long, the broad, shallowly rounded apex erose-denticulate to nearly entire. Staminodia distally above a short geniculation producing a single,

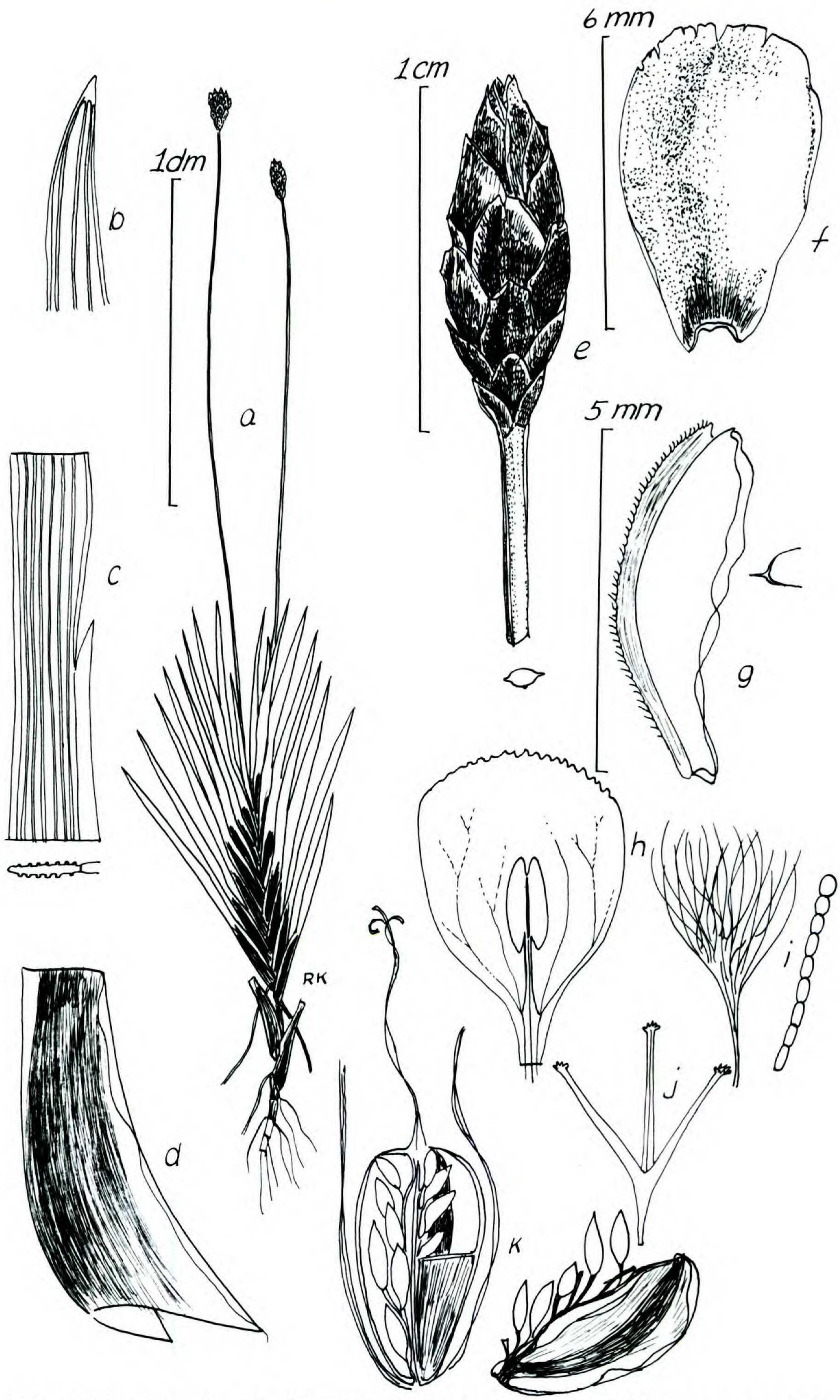


FIGURE 39A. Xyris witsenioides (Kral 70395).—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike, upper part of scape, cross section of scape.—f. Fertile bract.—g. Lateral sepal (rather broader and shorter than most).—h. Petal blade, stamen.—i. Staminode, enlarged hair.—j. Stylar apex.—k. At left, a longisector through capsule, with a placental strand showing its proximal and distal attachment; at right, another septum with upper part removed showing neighboring locule, a valve removed showing septum and placental strand (dark-shaded).*

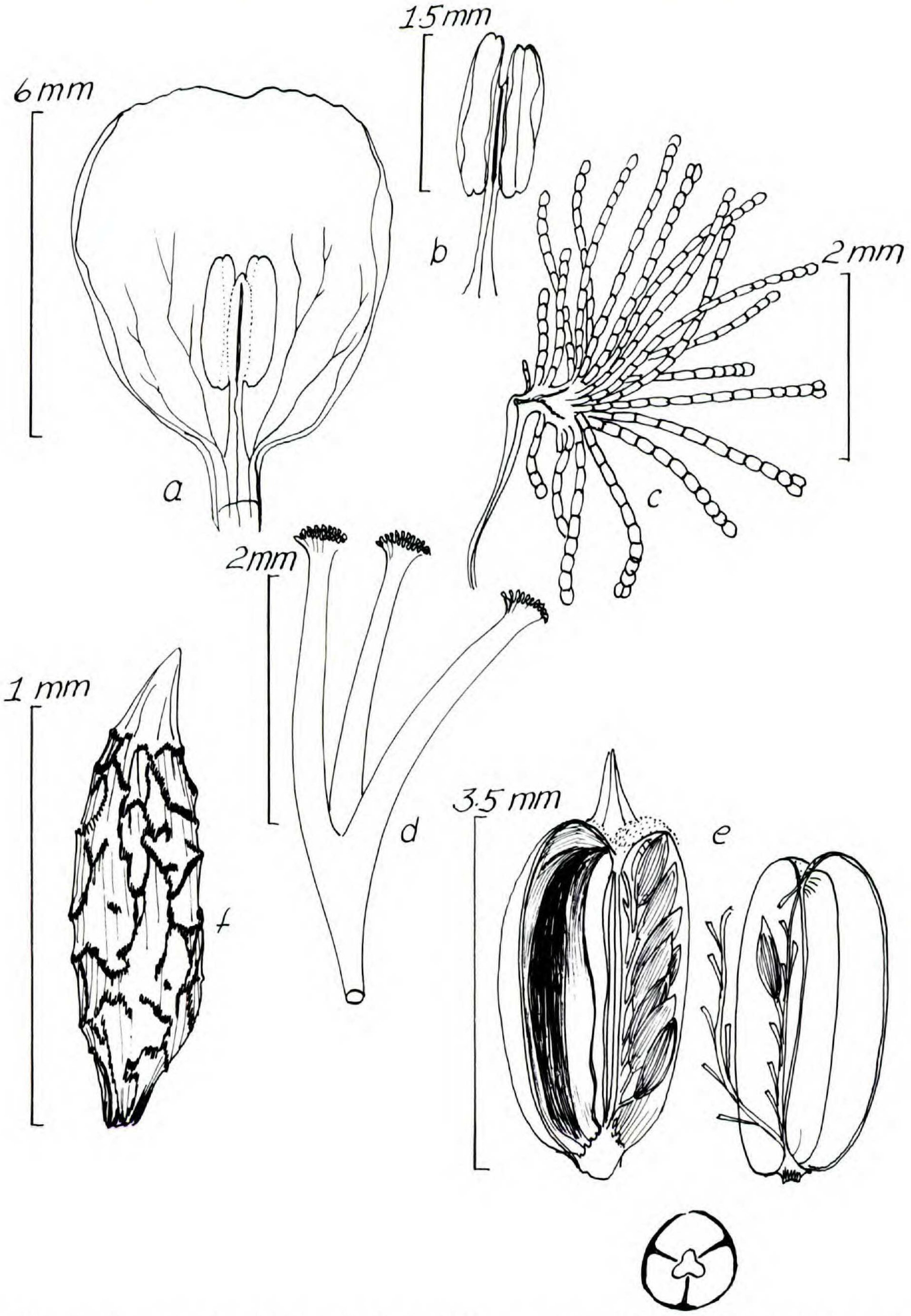


FIGURE 39B. Xyris witsenioides (Maguire et al. 432334).—*a. Petal blade, stamen.—b. Stamen, removed.—c. Staminode, much enlarged to show geniculation, beard hairs.—d. Stylar apex, much enlarged over petal, showing glandular stigmas.—e. Two views of capsule parts: left, most of one locule shown, together with contiguous valves (septum shaded dark at left); right, a fruit section removed to show septum, two placental strands; at base, a transverse section showing placental strands (center), valve edges, and septa.—f. Seed.*

densely penicillate pubescent blade. Anthers oblong, 1.5–1.7 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsules narrowly obovoid, 3.5–4 mm long, the valves with complete septa, at fruiting maturity with placentae separating from each other except at base and apex and from the septa. Seeds fusiform, ca. 1–1.3 mm long,

deep to pale amber, finely longitudinally ribbed, the fine ribs overlain by a coarser, broader, subanastomosing ribbing.

Distribution. Steep bluffs and rocky wet savanna, summits of tepuis, southern Territorio Federal Amazonas and Estado Bolívar in Venezuela, east to the boundary of Venezuela with Brazil and Guyana at the type locality: Roraima.

Additional specimens examined. BRAZIL: Roraima, Dec. 1909, *E. Ule 8547* (L). GUYANA: Mt. Roraima, Nov.–Dec. 1931, *Abbensetts 20* (U); Summit Roraima, *McConnell & Quelch 658* (K); Roraima escarpment, 21 Oct. 1973, *Persaud 88* (NY, UC); N slope of Mt. Roraima, 2,300 m, 16 Feb. 1985, *Renz 14270* (U); Summit Roraima, Autumn 1894, *Quelch & McConnell 95* (K); N slope of Mt. Roraima, 2,300 m, 16 Feb. 1985, *Renz* (U); N ridge scarp of Mt. Roraima, ca. 6,500–7,000 ft. at 6,600 ft., 26 Mar. 1978, *Warrington et al. K. E. R. 62* (K). VENEZUELA. T. F. AMAZONAS: Cerro de Marahuaca above Salto Los Monos, 2,555 m, 26 Feb. 1985, *Liesner 17992* (MO, VDB); Neblina, upper escarpment slopes E of Camp III, 1,600–1,800 m, 27 Dec. 1953, *Maguire et al. 36932* (NY, US); Neblina, Cumbre Camp, 1,700 m, 5 Jan. 1954, *Maguire et al. 37064* (GH, MO, NY, US); Neblina, E of Camp III, 1,600 m, 24 Jan. 1954, *Maguire et al. 37371* (NY, US); Neblina, banks of Caño Grande, E of Cumbre Camp, 1,100 m, 24 Nov. 1957, *Maguire et al. 42200* (GH, K, NY, VEN); Neblina, upper Cañon Grande, 1,900 m, 11 Dec. 1957, *Maguire et al. 42334* (F, K, NY, US, VEN); Cerro Marahuaca, cumbre, sección suroriental, 2,685 m, 15 Jan. 1981, *Maguire et al. 65634* (NY, VEN); headwaters of Cañon Grande, SE portion, 1,900 m, *Steyermark 104007* (NY, US, VEN); Cerro Marahuaca-FHUIF, cumbre, altiplanicie de rocas expuestas, 2,330–2,470 m, 3–4 Feb. 1982, *Steyermark et al. 126079* (NY, VDB); same area and collectors, 9–10 Feb. 1982, *Steyermark et al. 126313* (NY, VDB, VEN); Cerro Marahuaca, cumbre extremo noreste, 2,580–2,700 m, 1 Apr. 1983, *Steyermark & Delascio 129297* (VDB, VEN); Cerro Aratitiyope, ca. 70 km al SSW de Ocamo con riachuelos afluente al Río Manipitare, 1,550 m, 24–28 Feb. 1984, *Steyermark et al. 130287* (VEN). BOLÍVAR: Alto Caroni, Guyana, del Cerro Yaipan, 7,800 m, *F. Cardona 2421* (VEN); Valle Encantado, Lado derecho del Salto Angel, Auyantepuy, 15 Aug. 1968, *Foldats 7109* (VEN); Cumbre del Yuruani-tepui, ca. 12 km al NNE del Kukenan-tepui, 2,200 m, 29 Feb. 1984, *Huber 9078* (MYF, VDB); Macizo del Guaiquinima, sector centro-noroccidental, 1,350 m, 2 Apr. 1984, *Huber 9364* (MYF, VDB); Cumbre del Ilú-(Urú-)tepui, sector centro-meridional, 29 Apr. 1984, *Huber 9493* (MYF, VDB); sección mas septentrional del Brazo occidental del Auyantepui, ca. 25 km al SE de Canaima, 13 Nov. 1984, *Huber 9727* (MYF, VDB); cumbre del Ptari tepui, ca. 22 km al NNW de la Misión de Kavanayen, ca. 2,400 m, 19 Nov. 1984, *Huber 9828* (MYF, VDB); Kukenani-(Mataui-)tepui, cumbre meridional, 2,700 m, 15 June 1985, *Huber & Alarcon 10525* (MYF, VDB); Serranía Guanay, sect. nororiental, cabeceras mas orientales del Río Parguaza, ca. 1,700 m, 20–28 Oct. 1985, *Huber 10968* (MYF, VDB); Altiplanicie del Auyan tepui, sector centro-oeste, 1,860 m, 19 Jan. 1986, *Huber 11237* (MYF, VDB); Ptari-tepui along trail from camp to SW shoulder of mt., vic. Cave Rock Camp, 1,600–2,000 m, 14–19 Aug. 1970, *Moore et al. 9807* (VEN); Mt. Roraima, 9,000 ft., *H. S. Irwin 441* (NY, US); Uaipan-tepui, summit of West Peak, 1,980 m, 4 Mar. 1967, *Koyama & Agostini 7438* (NY, US); Cerro Guaiquinima, 1,500 m, 31 Dec. 1951, *Maguire 32883* (NY, US); Cerro Guaiquinima, open savanna 1 km S of Cumbre Camp, 1,800 m, 29 Dec. 1951, *Maguire 32799* (K, NY, US, VEN); ca. 6.5 km N of Pioneer Monument by Ven. 10, summit La Escalera, ca. 1,200 m, *Kral 70395* (F, K, L, MO, NY, SP, U, US, VDB, VEN); Cerro Guaiquinima, North Valley, 1,600–1,700 m, 4 Jan. 1952, *Maguire 32957* (NY, US, VEN); Ilu-tepui, Gran Sabana, 6,000–7,000 ft., 16 Mar. 1952, *Maguire 33433* (NY, US); Mt. Roraima, 2,100–2,255 m, 27 Sep. 1944, *Steyermark 58719* (F, NY, US, VEN); Ptari-tepui, 2,000–2,200 m, 2 Nov. 1944, *Steyermark 59736* (F, US, VEN); Sierra de Lema, base of uppermost waterfall of Río Chicanan, *Steyermark 89551* (NY, US, VEN); Auyan-tepui, cumbre, 1,760 m, 11 May 1964, *Steyermark 93665* (F, NY, US, VEN); Auyan-tepui, cumbre de la parte sur, 2,050–2,300 m, 15 May 1964, *Steyermark 93966* (F, NY, US, VDB, VEN); Cerro Roraima (near boundary markers), *Steyermark et al. 112501* (F, K, NY, US, VEN); Cumbre de Cerro Guaiquinima, 26 Jan. 1977, *Steyermark & Dunsterville 113518* (NY, VEN); Ptari-tepui, 2,360–2,420 m, 23 Feb. 1978, *Steyermark et al. 115716* (F, MO, US, VEN); Aprada-tepui, 2,460–2,500 m, 25 Feb. 1978, *Steyermark et al. 115895* (F, MO, NY, U, US, VEN); Auyan-tepui, 1956, *Vareschi & Foldats 4907* (VEN).

The above citations, while far from complete, help illustrate the considerable variation in habit, leaf, and spike characters displayed sometimes even on the same tepui. This is perhaps one of the most distinctive morphologies in the genus, individual plants forming enormous dome-shaped clumps of foliage from which the slender scapes stand out like long pins from a pincushion. Out of so many collections, some represented by many duplicates, few capsules with full seed can be found, thus this species appears to be one of the poorest seed setters in *Xyris*. The question then arises as to why it is so widespread and seemingly successful.

40. Xyris xiphophylla Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 20–21, fig. 6A–E. 1963. TYPE: Venezuela. T. F. Amazonas: abundant in wet escarpment savanna, 4–8 km south

of Cumbre Camp, 1,850–1,900 m, Cerro de La Neblina, Río Yatua, 15 Jan. 1954, *B. Maguire, J. J. Wurdack & G. S. Bunting 37312* (holotype, NY; isotypes, US, VEN). Figure 40.

Robust, densely cespitose, smooth perennial 5–8 dm high, the stems short and stout or up to 5 or 6 cm long; sheaths eciliate, as long as blades or longer, with broad, dark reddish brown or castaneous bases, gradually narrowing to blades and with a triangular erect or divaricate ligule to ca. 2–3 mm long; blades straight, strongly flattened, narrowly lance-linear, 5–10 mm wide, broadening just above ligule, then narrowing evenly to an acute, erect or slightly falcate apex, the tip slightly thickened; margins smooth, edges thin, producing a narrow, subcartilaginous border; surfaces deep green, smooth, with numerous low, wide nerves. Scape sheaths shorter than most leaves, deep brown, multicostate, carinate at base, opening and producing a short blade above. Scapes somewhat flattened distally (narrowly elliptic or ovate in cross section), sometimes slightly ancipital, 2–3 mm wide, the edges blunt, the surfaces smooth, sometimes striate. Spikes narrowly cylindric-obovoid, to ca. 2 cm long, the base acute to attenuate, the apex blunt, the inflorescence of many, loosely imbricate but firm, dark brown or pale brown, dull bracts in nearly vertical rows and without dorsal areas, the sterile bracts much smaller, narrower than the fertile bracts and grading into them, the fertile bracts oblong, 10–15 mm long, apically narrowly rounded, with a short, subapical, glossy carina or apiculus, the margins entire, aging lacerate. Lateral sepals free, subequilateral, lineal, 10–12 mm long, acute, the narrow, dark keel entire or papillate toward apex. Petal blades broadly obovate, 6–7 mm long, yellow, the shallowly rounded apex crenulate. Staminodia not evident. Anthers narrowly oblong, 2–2.5 mm long, deeply bifid and sagittate, on short filaments to ca. 0.5 mm long. Capsule cylindric, 6–8 mm long, strongly septate from tip to base, the placentation axile, the placental axis extending ¾ up the fruit. Seeds lance-ovoid, 1.5–2 mm long, pale to deep amber, finely longitudinally anastomosing-ribbed.

Distribution. Wet, rocky savanna, summit elevations, Cerro de La Neblina, Territorio Federal Amazonas, Venezuela, locally abundant.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: low bush slopes near Cumbre Camp, 1,800 m, 4 Jan. 1954, *Maguire et al. 37051* (paratype, NY, US); planicie de Zuloaga, Río Titirico, 2,300 m, 10–15 Oct. 1970, *Steyermark 103825* (K, NY, US, VEN). More recent collections, not yet fully distributed, are: Valle de Titirico N of Pico Phelps, ca. 2,300 m, 1 Dec. 1984, *Kral 71914*; Camp 2, 2.8 km NE of Pico Phelps, 2,100 m, open bog, 15 Apr. 1984, *Stein & Gentry 1578* (MO, VDB, etc.); al norte del campamento base a lo largo del Río Mawarinuma, afluente del Río Baria, 1,880 m, 7–8 Feb. 1984, *Steyermark & Luteyn 129819* (MO, NY, VDB).

This species is another with the tendency to form frondlike plates of leaves and is superficially closest to forms of *X. ptariana* Steyerm. In the savanna of the Valle de Titirico it is the dominant xyrid, its pale yellow flowers unfolding in morning.

41. Xyris spruceana Malme, Bih. Svensk. Vet. Akad. Handl. 26(3)[19]: 12, pl. 1, f. 2. 1901. TYPE: Venezuela: ad fluv. Guainía v. Río Negro supra ostium fluvensis Casiquiari, in 1854, *R. Spruce 2993* (isolectotypes, GH, NY). Figure 41.

X. applanata Idrobo & Lyman B. Smith, Caldasia 6(29): 239–240, fig. 27a–h. 1954. TYPE: Colombia. Vaupés: Río Kananari, Cerro Isibukuri, piedra de arenisca, 250 m, 28 Oct. 1951, *R. E. Schultes & I. Cabrera 14466* (holotype, COL; isotypes, F, GH, MG, US, VDB).

Low, cespitose annual 0.8–2.5 dm tall, the stems contracted. Leaves ascending or spreading flabellately, mostly 5–15 cm long; sheaths from ½ as long to longer than blades, eciliate, sharply keeled, brown at very base, above stramineous, pink or pale purple, shading to pale green, progressively narrowing into blade, there either eligulate or with a narrowly triangular ligule less than 1 mm long; blades ensiform-linear, flat, 1.5–3 mm wide, narrowing gradually to an acute apex above middle, the margins slightly incrassate, papillose

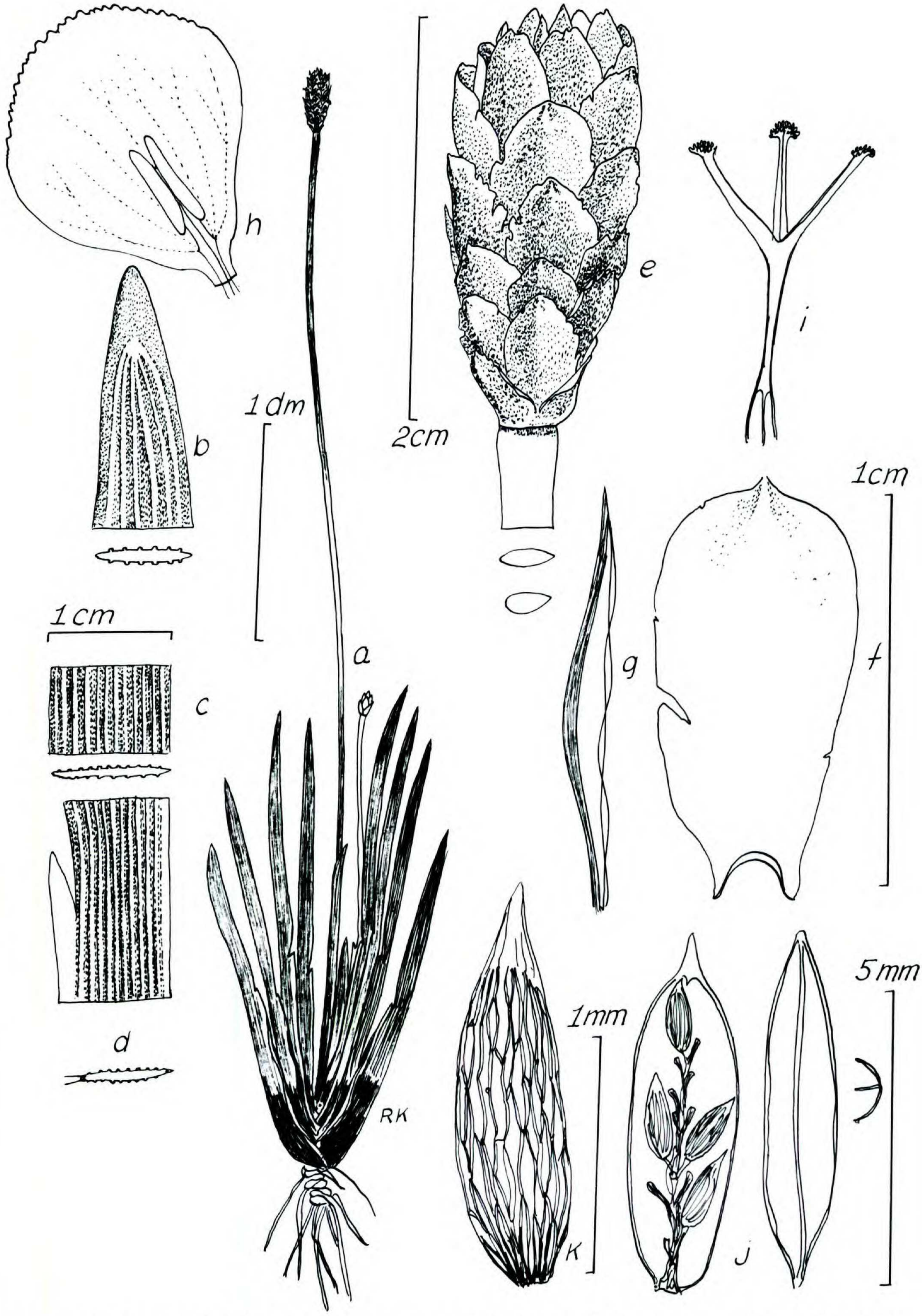


FIGURE 40. Xyris xiphophylla *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Sector of leaf blade at widest point.—d. Leaf sheath–blade junction.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Stylar apex.—j. At left, median long view of capsule, showing placentae; at right, inside view of one valve, cross section of valve to show septum.—k. Seed.*

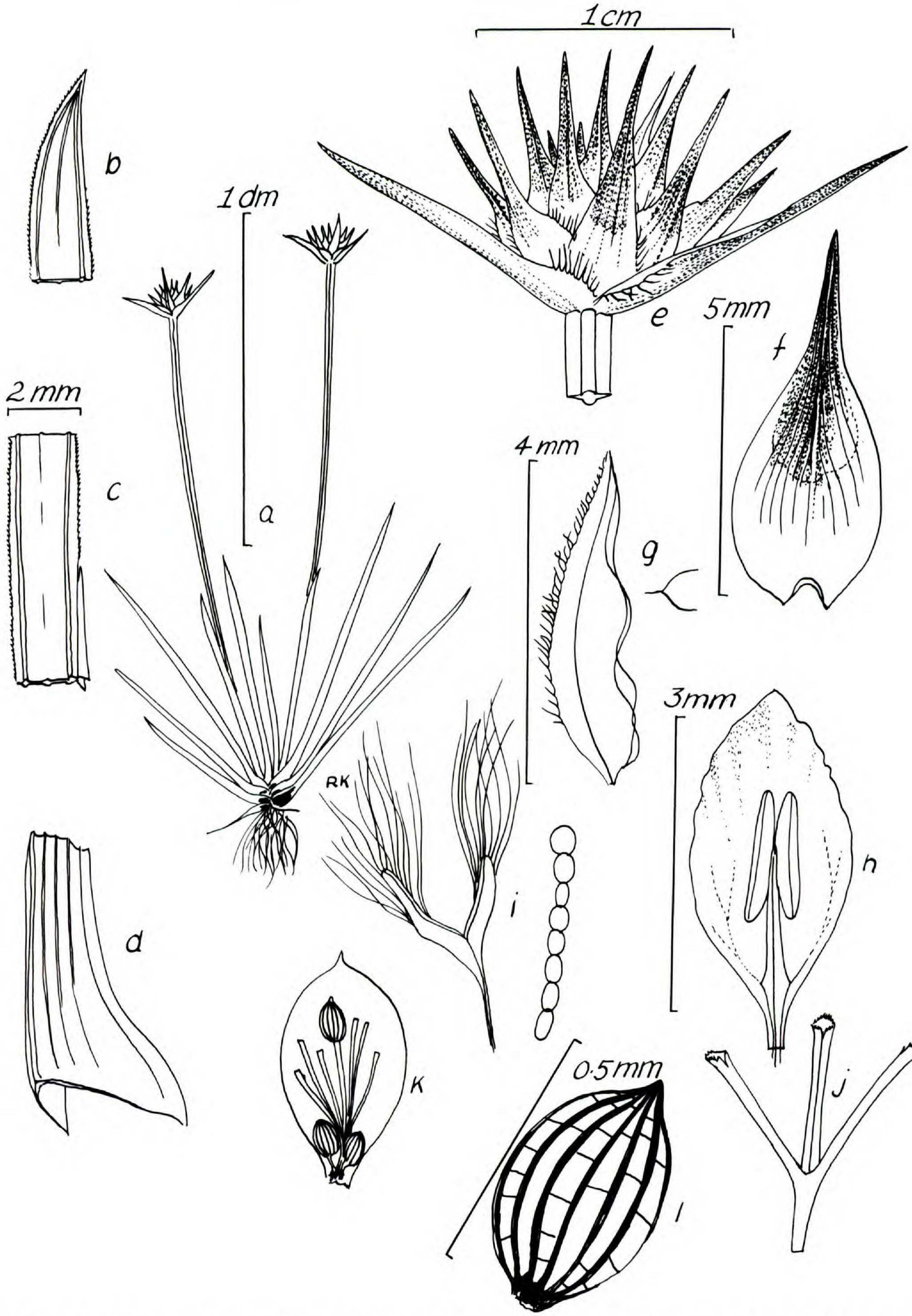


FIGURE 41. Xyris spruceana (Clark 6455).—*a. Habit sketch.—b. Leaf apex.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair tip.—j. Stylar apex.—k. Capsule, showing basal placentation, valve outline.—l. Seed.*

to scabridulous or minutely ciliate, the surfaces green, often bordered by a pale brown band and a strong submarginal nerve, smooth, multinerved. Scape sheaths carinate at base, strongly bladed, similar to foliage leaves. Scapes appearing strongly flattened, distally 2–3 mm wide, scape body slightly flattened, usually with 1–2 ribs/side, the lateral costae alate, broader than scape body, ciliolate or papillate or entire. Heads turbinate to hemispheric, 0.7–1 cm high, with several spirally and loosely imbricate bracts, involucrate, with at least some sterile bracts leaflike with foliaceous, spreading or ascending, green-keeled blades, the blades elongate, sharply and ciliately keeled, spreading or overtopping, longer than the spike to slightly shorter, and with bases broadly margined, scarious, reddish, fimbrio-ciliate; fertile bracts ovate or lanceovate, 5.5–6.5 mm long, strongly carinate, the large green, venose dorsal area excurrent to form an acuminate-subulate apex, or merely acute. Lateral sepals free, inequilateral, thin, broadly lanceolate, ca. 4 mm long, acute, the darker firmer keel ciliolate or villose with rusty hairs. Petal blades elliptic, 3.5–4 mm long, yellow, subacute, the margin undulate. Staminodia bibrachiate, the oblong, flat branches long-penicillate-ciliate. Anthers oblong, ca. 1 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsule obovoid, 2–3 mm long, placentation basal, the valves without septa. Seeds numerous, ovoid to ellipsoid, ca. 0.5 mm long, apiculate, lustrous but opaque, with ca. 14 strong, dark brown, longitudinal ribs.

Distribution. Locally common in wet, sandy, savanna–forest transition or in white-sand savanna, along the Rio Negro and tributaries from Amazonian Brazil (Amazonas) northward into southern Colombia and southern Territorio Federal Amazonas, Venezuela.

Additional specimens examined (only Colombian and Venezuelan records are cited here). COLOMBIA. VAUPÉS: Río Apaporis, Jirijirimo, 250 m, 26 Nov. 1951, *García-Barriga 13729* (NY); Puerto Colombia (opp. Maroa), 130 m, 12 Oct. 1957, *Maguire et al. 41848* (F, NY); Río Negro, El Castilo, San Filipe, 12 Dec. 1947, *Schultes & López 9333A* (NY); Cachivera de Jirijirimo, ca. 250 m, 13 June 1951, *Schultes & Cabrera 12392* (GH, NY); Río Apaporis, Cachivera de Jirijirimo, 13 June 1951, *Schultes & Cabrera 12392* (GH); same locality, 12 Aug. 1951, *Schultes & Cabrera 13512* (GH, NY); same locality, 16 Sep. 1951, *Schultes & Cabrera 14055* (F, GH); same locality, 21 Jan. 1952, *Schultes & Cabrera 14949* (COL, F, GH, US, VDB); Río Kananarí, ca. 250 m, Cachivera Palito, 25 July 1951, *Schultes & Cabrera 13187* (GH); Cerro Isibukurí on summit, 6 Aug. 1951, *Schultes & Cabrera 13401* (GH); Cerro Yapoboda, ca. 450 m, 5 Oct. 1951, *Schultes & Cabrera 14263* (GH); Río Kananarí, Cerro Isibukurí, 29 Oct. 1951, *Schultes & Cabrera 14535*; Cerro Isibukurí, *Schultes & Cabrera 14466* (isotype of *X. applanata*, F, GH, MG, NY, US, VDB); Raudal Jirijirimo below mouth of Kananarí, ca. 900 ft., 21 Jan. 1949, *Schultes & Cabrera 14949* (F, GH); Río Piraparana, Aug. 1952, *Schultes & Cabrera 17116* (GH); 18 Sep. 1952, *Schultes & Cabrera 17504, 17553* (GH); Río Negro, San Felipe and vic., Puerto Colombia, 31 Oct.–2 Nov. 1952, *Schultes et al. 18189* (GH); Río Piraparana, Cerro E-ree-ee-ko-mee-o-kee, 30 Aug.–18 Sep. 1952, *Schultes & Cabrera 17499* (F, GH, MG, VDB, US); Río Guainía, Caño del Caribe, 2 Nov. 1952, *Schultes et al. 18249* (GH); Río Vaupés, falls of Yurupari, 12 Apr. 1953, *Schultes & Cabrera 19002* (GH); same locality, Nov. 1951, *Schultes & Cabrera 19732* (GH); Mitu and vic. along Río Vaupés at Circasia, 14 Sep. 1976, *Zarucchi 2049* (GH). VENEZUELA. T. F. AMAZONAS: San Carlos de Río Negro, 28 Sep. 1978, *Clark 6827* (NY); 3 km NE of San Carlos, 31 Dec. 1977, *Clark 6455* (MO, NY); raudal "pereza" en el Río Autana, 9 Nov. 1984, *Guanchez & Melgueiro 3426* (TFAV, VDB); km 11 de la carretera San Carlos–Solano, 16 Sep. 1980, *Huber et al. 5677* (US); carretera San Carlos–Solano, entre los km 4 y 20, 15 Sep. 1980, *Huber & Medina 5639* (US); 4 km E San Carlos de Río Negro, 11 Nov. 1977, *Liesner 3365* (NY, MO); 1–2 km SE and E of San Carlos, 22 Apr. 1979, *Liesner 6870* (MO, VDB); Río Guainía, Yavita–Pimichín trail near Pimichín at 140 m, 22 Nov. 1957, *Maguire et al. 36337* (GH, NY); Bana, 2 km N de San Carlos, 6 Feb. 1977, *Morillo & Hasegawa 5155* (VEN); same locality, 6 Feb. 1977, *Morillo & Villa 5355* (VEN).

A number of specimens are cited above to illustrate the degree of variation in involucral bract and fertile bract in the species. This variation includes, as a continuum, *X. applanata* Idrobo & Lyman B. Smith.

42. Xyris uleana Malme, Repert. Spec. Nov. Regni Veg. 3: 113. 1906. TYPE: Auf nassem Sandbogen, Bl. Gelb., Manaos, Rio Negro, Mai 1902, Amazonas Expedition *E. Ule*, Herbarium Brasiliense No. *6171* (lectotype, B; isolectotypes, GH, L, U; phototype, F).

X. duidensis Malme, Bull. Torrey Bot. Club 58: 325. 1931. TYPE: Venuezuela. T. F. Amazonas: summit

of Mount Duida, 4,000 ft., Gorge of Caño Negro, Savanna Hills, *G. H. H. Tate 811* (lectotype, NY; isolectotype, US).

X. vaupesiana Idrobo & Lyman B. Smith, Caldasia 6(29): 237–238, fig. 26a–f. 1954.

This complex of little plants varies so much as to leaf and scape, trichomal features, relative length of spike and sterile bracts, and degree of sepal connation, that it is understandable that several variants have been described as species. Certainly two varieties appear, as follows:

KEY TO VARIETIES OF *XYRIS ULEANA*

1a. Scapes distally ancipital, the costae produced as 2 flat wings comprising the edges; leaf blades over 1 mm wide ..... 42a. *X. uleana* var. *uleana*

1b. Scapes at most low-costate, terete, rarely with 1–few low costae; leaves 1 mm wide or less ..... 42b. *X. uleana* var. *angustifolia*

42A. **Xyris uleana** Malme var. **uleana.**

Figure 42.

Cespitose, soft-based annual 0.6–1.5(–2.2) dm high, the stems contracted. Leaves erect to spreading flabellately, 3–10 cm long; sheaths eciliate, keeled, ½ as long as blades or more, brownish or tan, narrowing gradually to blades and usually eligulate; blades linear, strongly flattened, 1–3.5 mm wide, tapering to incurved-acute tips; margins thin or comprising a yellowish-incrassate nerve, smooth or papillate toward leaf apex; surfaces green or tinged with pink or maroon, finely nerved or with some strong, yellowish nerves, glabrous. Scape sheaths mostly shorter than leaves, keeled and multicostate proximally, distally with strong blades similar to leaves. Scapes straight, slightly twisted, appearing strongly flattened, 1–3 mm wide, with scape body actually often round and with 2 lateral costae, alate, in combined width broader than scape body, the wings smooth or scaberulous-ciliate, sometimes scape faces with 1 or 2 more low costae. Spikes broadly to narrowly ovoid, 3–5(–10) mm long, acute, of several tightly imbricate bracts, these with large dorsal areas, otherwise thin, scarious, papillose, pilose-ciliate, the lowest pair sterile, often with backs alate-keeled, with excurrent-bladed dorsal areas, often longer than the other bracts, sometimes exceeding spike and with tips incurved-cucullate or erect; fertile bracts 2–3.5 mm long, broadly obovate or suborbicular, cucullate, broadly rounded at apex, ecarinate, papillate, the margins usually pilose-ciliate. Lateral sepals free or connate at base, strongly inequilateral, 2.5–3 mm long, blunt, the broad, curvate keel ciliolate and/or papillate. Petal blades very broadly obovate, ca. 2 mm long, yellow, the wide, shallowly rounded apex coarsely few-toothed. Staminodia bibrachiate, the narrow, flat branches long-penicillate-ciliate. Anthers lance-oblong, ca. 0.5 mm long, deeply bifid and auriculate, on flat filaments ca. 0.5 mm long. Capsule broadly obovoid, ca. 1.5 mm long, the placentation basal. Seeds narrowly ovoid or ellipsoid, 0.5–0.7 mm long, pale amber, longitudinally with many wavy, narrow, sharp lines, sometimes also with a few, irregular, stronger, dark red ribs.

Distribution. Sandy wet savanna at low to high elevations, northern South America west of the Andes, the Amazon system and tributaries, southern Colombia east to the Guianas, also including the upper Orinoco and tributaries; northern Brazil from Mato Grosso and Amazonas east into Pará. Only some of the collections from Colombia, Venezuela, and the Guianas are cited below.

Additional specimens examined. COLOMBIA. VAUPÉS: Río Atabapo, 1 km W Cacagual, *Maguire et al. 36293* (NY, VEN); Río Kubiyú, Cerro Kanenda, ca. 800–900 ft., 10 Nov. 1952, *Schultes & Cabrera 15398* (id. as *X. applanata* Idr. & Sm.—COL, F, GH, MG, US, VDB), *18337* (GH), *18398* (COL, GH, VDB); Río Kuduyari, Yapoboda, ca. 900–1,000 ft., 18 Nov. 1952, *Schultes et al. 18531* (F, GH). GUYANA: Kaieteur Savanna, 1,200 ft., 7 Sep. 1937, *Sandwith 1422* (K, U); Kaietuk savana, 1,100 ft., 20 Aug. 1933, *Tutin 497* (K, U); Kaietur summit, 1,100 ft., 31 Aug. 1959, *Whitton 217* (K). SURINAM: wet-sand savanna in upper Sipaliwini area, 4 Sep. 1966 (U); Weyneweg, between Albina and Moengotapoe, savana-forest, 14 Aug. 1933, *Lanjouw 433* (U); *Lanjouw 433a* (an older plant—U). VENEZUELA. T. F. AMAZONAS: laja en raudal "pereza" en el Río Autana, 9 Nov. 1984, *Guánchez & Melgeiro 3422* (TFAV, VDB); hasta el pie occidental del Cerro Yapacana, ca. 100 m, 14–28 Feb. 1978, *Huber 1600* (US); al E del Caño Perro de Agua a unosa 30 km al SE de la confluencia Orinoco–Ventuari, 30 Nov.–1 Dec. 1978, *Huber & Tillett 2814* (US); cabeceras del Caño Cotua y la base occidental del Cerro Yapacana, *Huber & Tillett 3014* (US); *Cerro Moriche*, 120 m, 19 Feb. 1979, *Huber 3198* (US); base of

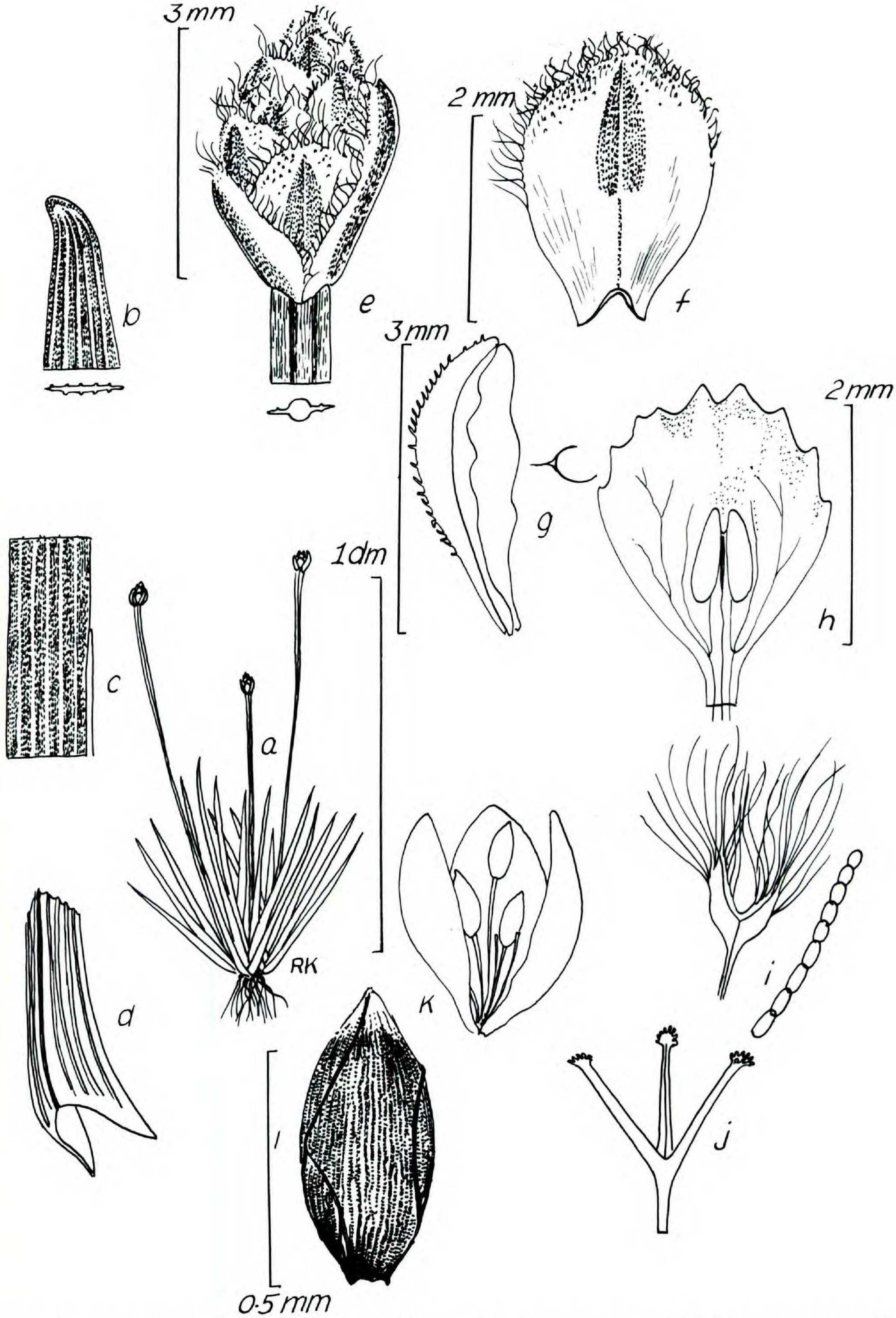


FIGURE 42. Xyris uleana *(*Kral 70610*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged apical part of beard hair.—j. Stylar apex.—k. Dehisced capsule showing basal placentation.—l. Seed.*

Cerro Yapacana, *Kral & Huber 70680, 70701* (F, K, MO, NY, SP, US, VDB, VEN); 30 km N of Puerto Ayacucho, 80 m, 5 Nov. 1980, *Maas & Huber 5149* (U, US, VDB); Salto Yutaje, 8 Nov. 1980, *Maas & Steyermark 5174* (U, VDB, VEN); summit Cerro Guanay, 1,800 m, 2 Feb. 1951, *Maguire et al. 31704* (id. as *X. duidensis*—GH, K, NY, US, VEN); near Pimichín, 140 m, 22 Nov. 1953, *Maguire et al. 36338* (GH, NY, US); Cerro Sipapo, 1,400 m, 25 Dec. 1948, *Maguire & Politi 27916* (NY); ibidem, savanna vic. base camp, 125 m, 30 Dec. 1948, *Maguire & Politi 28041* (NY); Danta Falls, Río Cuao, Río Orinoco, 30 km below La Urbana, 14–15 May 1949, *Maguire & Politi 29083* (F, US); Cerro Duida, Río Cunucunuma, Caño Culebra, 1,000–1,100 m, 18 Nov. 1950, *Maguire et al. 29519* (NY, US, VEN); summit Cerro Duida, Brocchinia Hills, 1,700–1,980 m, 1 Sep. 1944, *Steyermark 58145* (id. as *X. duidensis*—F, GH, MO, NY, US, VEN); topotype, 1 Feb. 1975, *Tillett & Talukdar 752-142* (K, NY, U, VEN). BOLÍVAR: region de Canaima, Salto Hacha, 16–17 Feb. 1964, *G. Agostini 266* (VEN); top of Salto Aicha near E base of Uaipan-tepui, 1,100 m, 27–28 Nov. 1982, *Davidse & Huber 22857* (MO, VDB); Vallé Encantado, lado derecho del Salto Angel, Auyantepuy, *Foldats 7178* (id. as *X. duidensis*—VEN); Seranía Guayay sector nor-oriental, 20–28 Oct. 1985, *Huber 10967* (MYF, VDB); S foot of peaks of Uaipan-tepui, 1,200 m, 6 Mar. 1967, *Koyama & Agostini 7513* (NY, US, VEN); along Río Karuai, NW of Kavanayen, 1,220 m, 30 Nov. 1944, *Steyermark 60823* (F, US, VEN); Sierra Ichun, Salto Maria Espuma del Río Ichun, 28 Dec. 1961, *Steyermark 90340* (F, NY, US, VEN); Sierra Pakaraima, 4–5 May 1973, *Steyermark 107266* (F, MO, U, VEN, US); cumbre de Cerro Guaiquinima, Salto del Río Szczerbanari, 750 m, 20–25 Jan. 1977, *Steyermark et al. 113150* (MO, NY, US, VEN); Cerro Marutani, 1,200 m, 11 Jan. 1981, *Steyermark 123881* (NY, VDN). Two *Kral* numbers from the Gran Sabana collected with *A. Gonzalez* in 1983 and with distributions to F, MO, NY, US, VDB are *Kral 70389* and *70610*; two more from the Gran Sabana in Dec. 1984 and awaiting full distribution are *72157* and *72192*.

This variety is one of the weediest of the annual *Xyris* species, coming in solidly in disturbed sandy moist savanna and sandy washes in the Guayana Highland. It can, in dense populations, range from dwarf plants a few centimeters tall to quite tall. Generally, well-spaced individuals on moist, peaty sites range between one and two decimeters in height. The pale yellow flowers open in the morning.

42B. Xyris uleana var. **angustifolia** Lanj., Kew Bull. 1939: 562. 1939. TYPE: Guyana: Kaieteur Savanna, in damp sand, ca. 1,200 ft., petals deep orange-yellow, 7 Sep. 1937, *N. Y. Sandwith 1421* (holotype, K; isotypes, NY, U).

X. connectens Malme, Ark. Bot. 19(13): 2. 1925. TYPE: Brazil. Pará: cerca Belem, *Ducke* (type at BM).

The plants usually more slender and lower than in the type variety, the leaf blades narrower, mostly 0.5–1 mm wide, the edges smooth or papillate, the lower bracts typically shorter than the larger fertile ones, all bracts with papillate-tuberculate dorsal areas as in the type variety but bracts themselves with acute tips and entire to lacerate, eciliate margins. Lateral sepals mostly free.

Distribution. Low- to medium-elevation savanna, from Territorio Federal Amazonas in Venezuela west through southern Estado Bolívar to Guyana, infrequent. Also in Amazonas and Pará, Brazil.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Rincones de Chacorro, 30 km N of Puerto Ayacucho, savanna, 80 m, 5 Nov. 1980, *Maas & Huber 5127* (US). BOLÍVAR: seeps among sandstone boulders by Ven. 10, ca. 800 m, N of Río Yuruani Ferry at Puente Kumerepa, 12 Dec. 1985, *Kral 72193* (MYF, VDB, VEN, and to be distributed). GUYANA: Pakaraima Mt., Mt. Aymatoi, 1,150 m, 15 Oct. 1981, *Maas et al. 5687* (U); Kaietuk Savanna, 1,100 ft., Aug. 20, 1933, *Tutin 497* (K).

This low variety of *X. uleana* is often in mixed populations with the type variety but is less frequent and could be mistaken for smaller, shorter-spiked *X. paraensis* var. *paraensis*. However, the dorsal areas of the latter are not strongly papillose-tuberculate. The terete scapes have sharp but low costae, very unlike the usually winged costae of the type variety.

43. Xyris calderonii Kral, Lyman B. Smith & Wanderley, sp. nov. TYPE: Brazil. Amazonas: Transamazon Highway, 9 km W of Rio dos Pombos, ca. 1.5 km E of Igarapé dos Pombos, and ca. 64 km E of the Aripuanã. Common in white sand campina, flowers yellow, 18 June 1979, *Cleofé E. Calderón, O. P. Monteiro & J. Guedes 2549* (holotype, INPA; isotypes, US, VDB). Figure 43.

Planta humilis, annua, praeter inflorescentiam glabra. Radices filiformes. Folia linearia, solum basalia, 3–7 cm longa, flabellate expansa, vulgo vaginis scaporum longiora. Laminae vaginis 2–4-plo longiores, 0.5–1 mm latae, pla-

nae, rectae, longitudine paucicostatae, a basi ad apicem compressae, porphyreae vel flavovirentae, apicibus abrupte contractis, incurvato-acutis, marginibus integris, non incrassatis; vaginae carinatae, porphyreae, pluricostatae, praeter costas scariosae, marginibus scariosis stramineis, in laminas gradatim convergentibus aut ad apicem ligulam scariosam curtam latam fascientibus, infime gradatim expansae, acies integrae. Vaginae scaporum laxae, plerumque apertae, rectae, carinatae, laminis aut similis laminis foliorum aut brevibus. Scapi subteretes, filiformes plus minusve spiraliter torti, 5–10 cm alti, 0.4–0.5 mm crassi, distaliter leviter multicostati, costis laevibus. Spicae subglobosae vel late ovoideae, 3–5 mm longae, plurifloraе, obtusae, involucratae. Bracteae steriles 2–4, subdecussatae, villosiciliatae; par infimum foliaceum, rigidum, spica 2–5-plo longiorum, lanceolatum vel oblongum, 2–3 mm longum, carinatum, areis dorsalibus linearibus, viridibus et laminis similis laminis foliorum sed triangulatis; par intimum ovatum, convexum, scariosum, acutum vel acuminatum, profunde villosiciliatum, areis dorsalibus valde papillosis, vulgo sine laminis. Bracteae fertiles late ovatae vel suborbiculatae, 2.5–3 mm longae, valde rotundato-convexae, villosiciliati, areis dorsalibus ovatis, valde granulato-papillosis. Sepala lateralia libera, oblonga vel ovata, 2–2.5 mm longa, valde inaequilatera; ala carinali lata, a basi ad medium integra, a medio distante ciliata, apicem versus lacerata. Laminae petalorum late obovatae, ca. 3 mm longae, luteolae, ad apicem late rotundatae et valde erosae. Staminodia bibrachiata, brachiis parce longipenicillatis. Antherae oblongae, sagittatae, ca. 0.5 mm longae; filamenta ca. 0.8–1 mm longa. Capsula matura late obovata, planoconvexa, ca. 1 mm longa, placenta basalia. Semina late ellipsoidea, ca. 0.3 mm longa, pallide brunneola, plus minusve reticulata.

Low annual, smooth except for the inflorescence. Roots filiform. Leaves linear, strictly basal, 3–7 mm long, spreading flabellately, commonly longer than the scape sheaths. Leaf blades 2–4 times longer than sheaths, 0.5–1 mm wide, flat, straight, longitudinally few-costate, flattened from base to apex, brown to yellow-green, the tips abruptly narrowed, incurved-acute, the margins entire, not thickened; sheaths carinate, brown, many-ribbed, scarious except for the ribs, with the thin edges stramineous, gradually narrowing into the blades or apically producing a short, scarious, broad ligule, gradually dilating toward base, the edges entire. Sheaths of scape lax, mostly open, straight, carinate, with blades similar to those of foliage leaves or shorter. Scapes subterete, filiform, ± spirally twisted, 5–10 cm high, 0.4–0.5 mm thick, distally with many low, smooth costae. Spikes subglobose to broadly ovoid, 3–5 mm long, several-flowered, obtuse, involucrate. Sterile bracts 2–4, subdecussate, villous-ciliate, the lowermost pair foliaceous, rigid, 2–5 times longer than the spike, lanceolate to oblong, 2–3 mm long, carinate, the dorsal areas linear, green, with blades similar to those of foliage leaves but triangulate; inner pair (if present) ovate, convex, scarious, acute, very villous-ciliate, the dorsal areas strongly papillate, without blades. Fertile bracts broadly ovate to suborbicular, 2.5–3 mm long, strongly rounded-convex, villous-ciliate, the dorsal areas ovate, strongly granular-papillose. Lateral sepals free, oblong to ovate, 2–2.5 mm long, very inequilateral, with keel broad, distantly ciliate from base to middle, lacerate toward apex. Petal blades broadly obovate, ca. 3 mm long, yellowish, broadly rounded and strongly erose at apex. Staminodia bibrachiate, the branches sparsely long-penicillate. Anthers oblong, sagittate, ca. 0.5 mm long; filaments ca. 0.8–1 mm long. Mature capsule broadly obovoid, plano-convex, ca. 1 mm long, the placenta basal. Seed broadly ellipsoid, ca. 0.3 mm long, pale brown, ± reticulate.

There is no question that the affinities of this little plant are with *X. uleana* Malme; in the production of narrow leaf blades it is most similar to var. *angustifolia* Lanj., which also sometimes produces long-tipped basal bracts. However, the lateral sepals are smaller with a somewhat different keel configuration, and the dorsal areas are consistently long-excurrent to produce acicular blades several times longer than the subtended spike. The scapes are uniformly terete.

44. Xyris esmeraldae Steyerm., Fieldiana, Bot. 28(1): 109, fig. 16c. 1951. TYPE: Venezuela. T. F. Amazonas: Esmeralda Savanna, 200 m, Cerro Duida, 22 Aug. 1944, *J. Steyermark 57821* (holotype, F; isotype, NY). Figure 44A (44B—see synonym).

Xyris rugulosa Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 29, fig. 13A–E. 1963. TYPE: Venezuela. T. F. Amazonas: Cerro Sipapo (Paraque), frequent along banks of small shaded stream savanna about pool, Caño Negro, 1,300 m, 15 Dec.

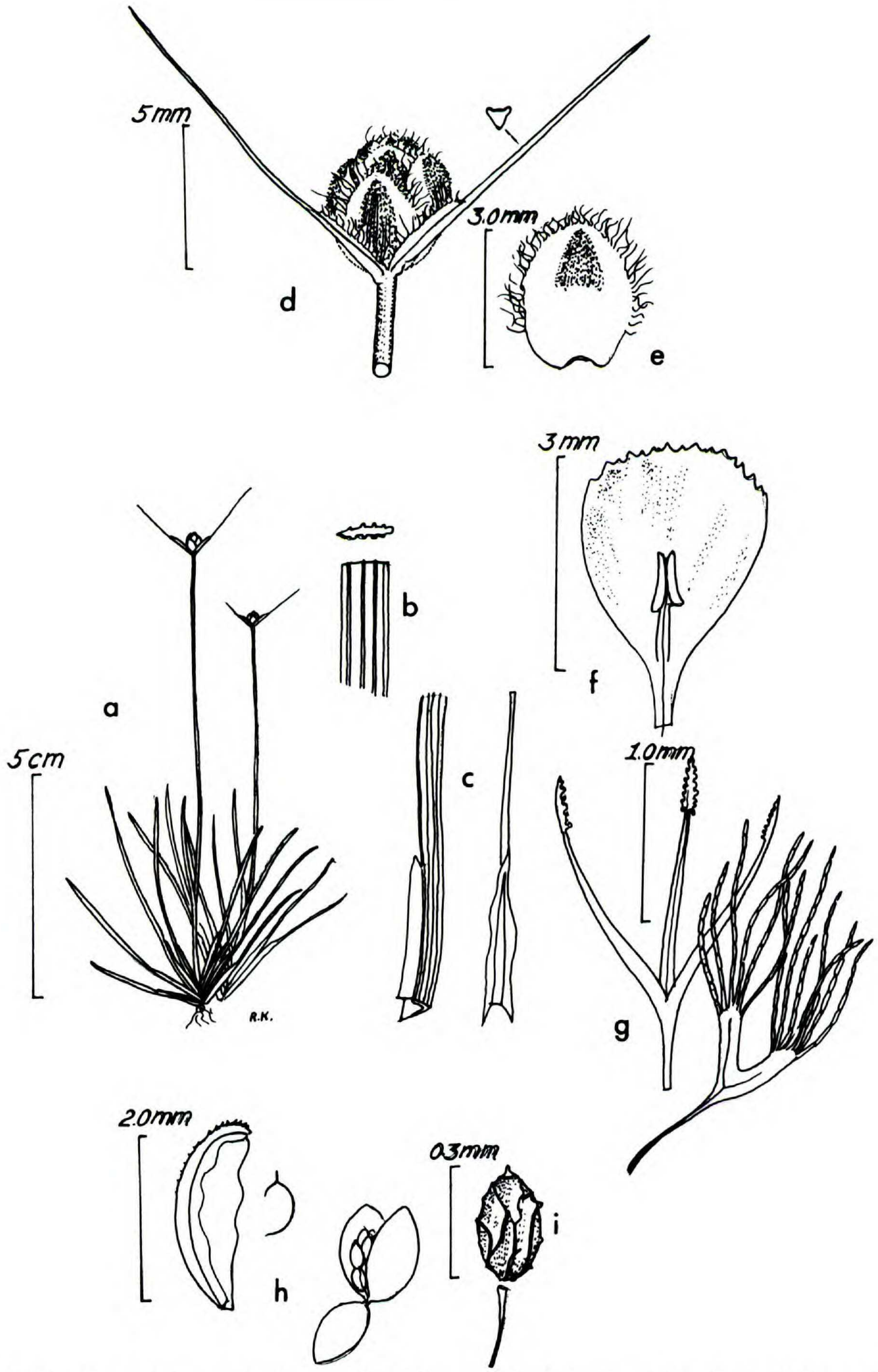


FIGURE 43. Xyris calderonii (Calderon et al. 2549).—*a. Habit sketch.—b. Leaf at midblade.—c. Leaf blade–sheath junction, side (left) and ventral (right) views.—d. Mature spike.—e. Fertile bract.—f. Petal blade and stamen.—g. Stylar apex, staminode.—h. Lateral sepal, capsule.—i. Seed.*

1948, *B. Maguire & L. Politi 27699* (holotype, NY; isotypes, US, VEN). Figure 44B.

Low, slender, cespitose, smooth to papillose-rugulose annual 0.5–3 dm high, the stems contracted, the roots filiform. Leaves ascending or spreading flabellately, 1–5 cm long, often absent by full anthesis or represented only by scalelike sheaths; sheaths of longer

foliage leaves less than ½ as long as blades, pale lustrous brown, tapering gradually from base to blade, there with a narrowly triangular, erect ligule to 2 mm long, at this level broader than blade is wide, the blades linear, flat or somewhat twisted, much compressed, ca. 1 mm wide, green or maroon, gradually narrowing toward apex, to a narrowly acute or acuminate tip, this dorsally scabrid, the margins mostly pale-incrassate, scaberulous or smooth, the surfaces strongly few-ribbed, smooth, rugose or rugulose. Scape sheaths shorter than most leaves, the base tubular, ribbed, keeled, the apex short-bladed or with a cusplike blade. Scapes much twisted, straight or flexuous, flattened distally, ca. 0.8–1 mm wide, ancipital with smooth or tuberculate-scabrid costae making edges, the surfaces ribless or with 1–2 ribs per side, smooth or rugulose-scabrid. Spikes elliptic-lanceolate, 3.5–5 mm long, acute, uniflorous, subtended by a narrow castaneous collar, of few, strongly convoluted, erect, reddish brown, decussate bracts with distinct dorsal areas; sterile bracts 2 pair, shorter than the fertile bracts, the lowest pair ovate to lance-triangular, acute, strongly keeled, the inner pair ovate-triangular, slightly keeled, distally with a strong, narrow midnerve, acute or narrowly rounded, entire or lacerate; fertile bract solitary, narrowly to broadly obovate, much inrolled, ca. 4–6 mm long, broadly acute or narrowly rounded, with broad dorsal area and strong midnerve. Lateral sepals ca. ⅓ connate, 4–4.5 mm long, the lobes oblong, subequilateral but excentrically folded, pale red-brown, acute, the narrow firm keel scabrociliate at least from middle to apex. Petal blades obovate or elliptic-oblong, 2–3 mm long, yellow, the rounded apex lacerate-dentate. Staminodes either not evident or with obreniform, beardless blades. Anthers oblong, ca. 1 mm long, deeply bifid and sagittate on filaments ca. 1 mm long. Capsules obovoid, 2–3 mm long, the valves eseptate, the placentation basal. Seeds several on long funiculi, ellipsoid, 0.7–1 mm long, including a short, silvery apiculus (outer integument), the body deep amber, finely longitudinally and spirally anastomosing-ribbed.

Distribution. Low (mostly under 500 m) savanna, southeastern Colombia eastward along the upper Río Orinoco and the Río Negro and tributaries in Venezuela.

Additional specimens examined. COLOMBIA. AMAZONAS: Río Caquetá, Araracuara, sabana de la Angostura, 400 m, 21 Dec. 1951, *H. García-Barriga & Schultes 14165* (NY); Araracuara, Río Caquetá, 5 Sep. 1959, *Maguire et al. 44131* (NY); Río Miritiparaná, 8 May 1952, *Schultes & Cabrera 16410* (GH, NY). VAUPÉS: Río Vaupés, Caño Pacú, 6 Mar. 1944, *Schultes 5830* (NY); Río Kananarí, Cerro Isibukuri, 29 Oct. 1951, *Schultes & Cabrera 14536* (GH, VDB); Río Piraparaná, Caño Pacá, 19 Sep. 1972, *Schultes & Cabrera 17567* (GH, VDB); Río Kananarí, Cerro Isibukuri, 28 Oct. 1951, *Schultes & Cabrera 14445* (GH); Río Piraparaná, Raudal Na-hoo-gaw-he, 30 Aug. 1952, *Schultes & Cabrera 17110* (GH); San Filipes & vic., ca. 600 ft., 25 Oct. 1952, *Schultes et al. 18026* (GH); Río Parana Pichuna, ca. 700 ft., June 1953, *Schultes & Cabrera 19933* (GH). VENEZUELA. T. F. AMAZONAS: Río Negro, base Cerro Cucuy, 2 Mar. 1944, *Baldwin 3240* (VEN); middle part of Caño Yagua at Cucurital de Yagua, 8 May 1979, *Davidse et al. 17376* (MO, VDB); Cerro Duida, 1,000 m, Jan.–Feb. 1969, *Farinas et al. 436* (NY, VEN); S de la Sierra de Untuyan en las cabeceras del Río Mavacá, 550 m, *Guánchez 805* (TFAV, VDB); "Cerro la Trampa" al norte del medio Río Autana, 12 Nov. 1984, *Guánchez & Melgueiro 3531* (TFAV, VDB); IVIC Study area 4 km E of San Carlos de Río Negro, 120 m, 12 Nov. 1980, *R. Liesner 3381* (MO, NY, VDB); 10 km NE of San Carlos, white sand area, 7 Apr. 1979, *Liesner 6286* (MO); Cerro de La Neblina, Puerto Chimo Camp on Río Mawarinuma, 5 km E of Neblina Base Camp, 150 m, 13 Feb. 1984, *Liesner 15884*; Cerro Sipapo, savanna vic. Base Camp, 30 Dec. 1948, *Maguire & Politi 28034* (NY, US); Cerro Sipapo, banks along lower Caño Negro, 25 Dec. 1948, *Maguire & Politi 27916* (NY); Río Guainía, Yavita–Pimichín trail, near Pimichín, 22 Nov. 1953, *Maguire et al. 36326* (GH, NY, US); Cerro Paraque, 1,500 m, Feb. 1946, *Phelps 60* (VEN); 1 km al este de Maroa, 125 m, 20 Apr. 1970, *Steyermark & Bunting 102815* (U, US, VDB, VEN).

It becomes necessary to consider this the same as *X. rugulosa* Maguire & Lyman B. Smith, which does not differ in any essential character but only in the tendency in the latter toward narrower bract tips and more leafiness (cf. Fig. 44A, B). The rugulous epidermal feature supposed to be critical for *X. rugulosa* appears also on leaves of *X. esmeraldae*. Some of the trouble in past interpretation must come from the fact that *X. esmeraldae* proper tends to lose most of its larger foliage leaves as the plants approach seeding. However, when one finds these leaves, they are remarkably the same as those of *X. rugulosa*.

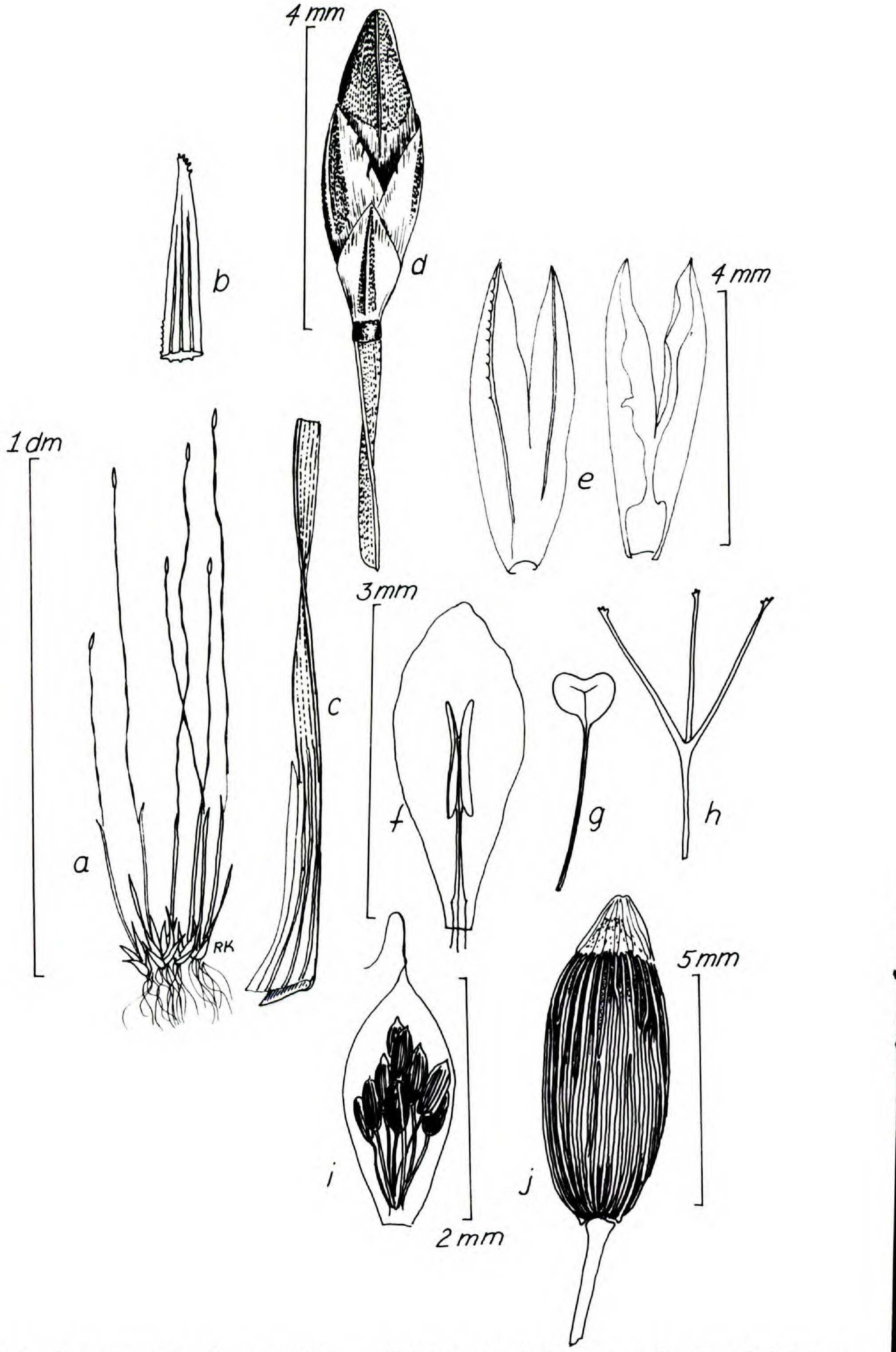


FIGURE 44A. Xyris esmeraldae (Liesner 7035). —*a. Habit sketch.—b. Leaf tip.—c. Leaf, midblade to base.—d. Spike.—e. Lateral sepals, two views.—f. Petal and stamen.—g. Staminode.—h. Stylar apex.—i. Capsule showing placentation.—j. Seed.*

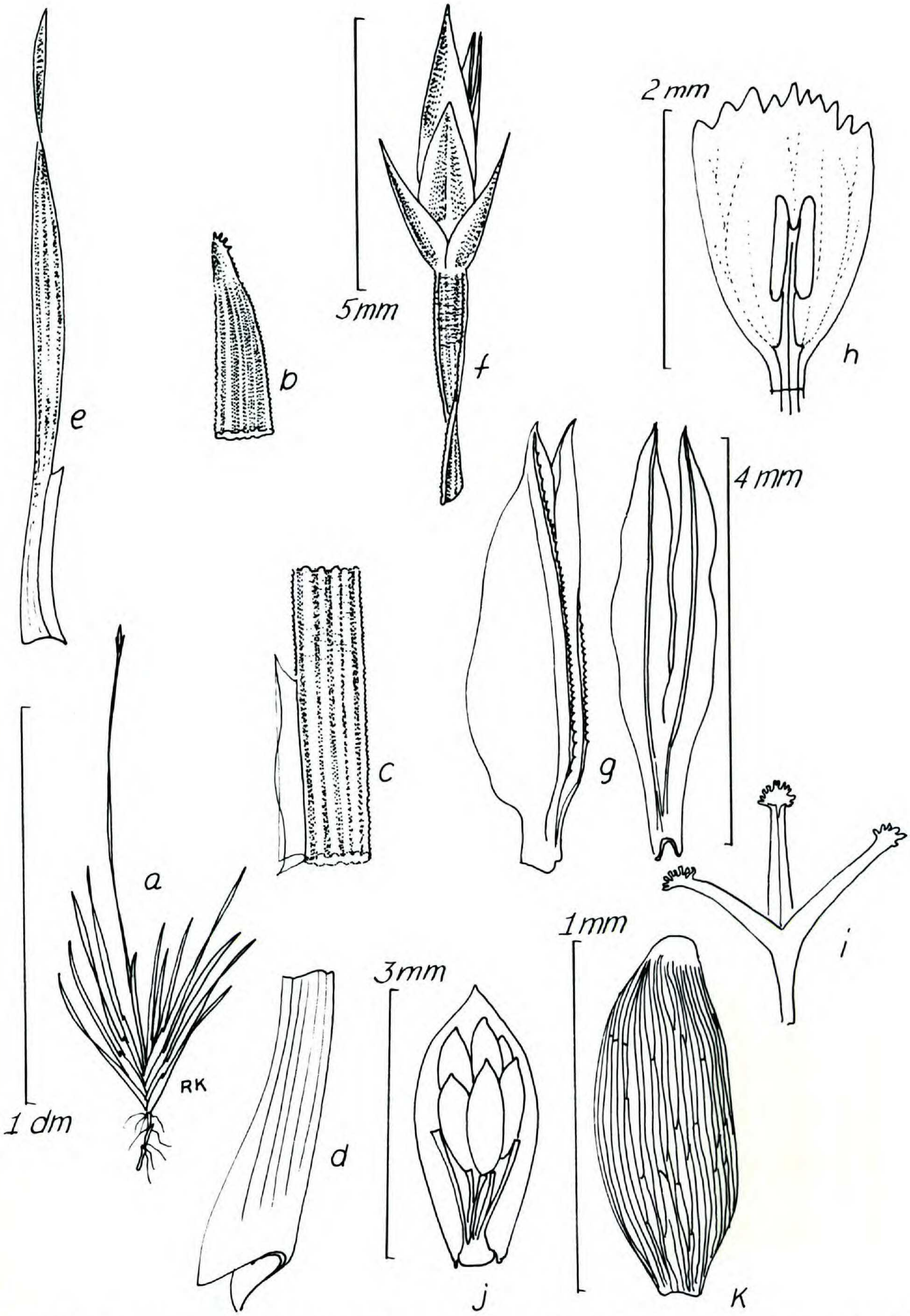


FIGURE 44B. Xyris esmeraldae (*from type of* X. rugulosa) .—*a. Habit sketch.—b. Leaf apex.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Whole leaf.—f. Spike.—g. Lateral sepals, two views.—h. Petal blade, stamen.—i. Stylar apex.—j. Capsule, two valves removed to show placentation.—k. Seed.*

45. Xyris subuniflora Malme, Rec. Trav. Bot. Neerl. 9: 129. 1912. TYPE: Dutch Guayana: "In arenosis humidis, Suriname," *Splitgerber 990* (lectotype, L; isolectotype, U). Figure 45.

Xyris capillaris Steyerm., Fieldiana, Bot. 28: 107. 1951. TYPE: Venezuela. T. F. Amazonas: between Esmeralda Savanna and southeastern base of Cerro Duida, 200 m, 22 Aug. 1944, *J. A. Steyermark 57835* (holotype, F; isotypes, GH, NY, VEN).

Densely cespitose, low and delicate, smooth, annual or short-lived perennial 3–10 cm high, the stems contracted. Leaves erect or spreading flabellately, 1–7 cm long; sheaths eciliate, soft, ½ as long as blades or less, the bases tan or pink, keeled, tapering evenly into blades or with a short, erect, triangular ligule less than 1 mm long; blades filiform but flat, 0.3–0.5 mm wide, tapering slightly above middle, then abruptly acute-apiculate or incurved-acute, the margins entire, the surfaces very finely nerved, maroon with olive tints. Scape sheaths ca. as long as leaves, twisted, tubular proximally and multicostate, distally open with a strong flat blade as in leaves. Scapes filiform, straight or flexuous, twisted, ca. 0.3 mm thick, distally terete, ecostate, finely striate, olivaceous to maroon. Spikes narrowly ellipsoid or linear-ellipsoid, drying lance-ovoid, 4–5 mm long, few-bracted, uniflorous; bracts with distinct lanceolate dorsal areas, the sterile bracts 4, 2.5–3 mm long, lanceolate, navicular, acute or narrowed-retuse; fertile bracts oblong to ovate, conduplicately folded around floret, ca. 4 mm long. Lateral sepals ca. ½ connate, ca. 3–3.5 mm long, the narrowly triangular, erect lobes inequilateral, acute with very low smooth keels similar to dorsal areas of bracts but narrower. Petal blades broadly obovate, ca. 3 mm long, yellow, the broadly rounded apex denticulate-lacerate. Staminodia bibrachiate, arising from just below sinus between petal blades, the branches short-penicillate-pubescent. Anthers oblong, ca. 0.8 mm long, deeply bifid and sagittate, on filaments ca. 0.5 mm long. Capsule broadly ellipsoid, brown, ca. 1.5 mm long, the placentation basal. Seeds few, broadly ellipsoid, 0.5–0.6 mm long, apiculate, dark brown and opaque, rather coarsely longitudinally ribbed and cross-ribbed.

Distribution. Low-elevation savanna, locally abundant, southeastern Colombia (Vaupés) eastward into Surinam and in contiguous Pará, Brazil.

Additional specimens examined. COLOMBIA. VAUPÉS: Caño del Caribe and vic., 850–900 ft., 2 Nov. 1952, *Schultes, Baker & Cabrera 18276-A* (US). GUYANA: Kaieteur Savanna, ca. 1,200 ft., 5 Sep. 1937, *Sandwith 1373* (K, U). SURINAM: Jodensavanne (Fluv. Suriname), 16 June 1957, *Heyligers 347, 781* (U); Zanderij savanna, Jansma 1 (U); via secta ab Moengo tapoe ad Grote Zwiebelzwamp, savanna near km 10.9, 8 Oct. 1948, *Lanjouw & Lindeman 720* (U); ibidem, ridge E of camp, 14.9 km, 20 Oct. 1948, *Lanjouw & Lindeman 128a* (U); Bronniveau Brinkheuvel, in kleine polletjes, Natuurreservaat Brinkheuvel, 11 Oct. 1967, *Teunissen & Wildschut LBB 11910* (U). VENEZUELA. T. F. AMAZONAS: entre Yavita y Maroa, ca. 204 km hacia Maroa (al sur) desde el empalme con la carretera Yavita–Pimichín, 125–140 m, 6–19 July 1969, *Bunting et al. 3925* (NY, U, VDB); S bank of middle part of Caño Caname, 30 Apr.–1 May 1979, *Davidse et al. 16928* (MO, VDB); km 11 de la carretera San Carlos–Solana, 120 m, 16 Sep. 1980, *Huber et al. 5666* (US); ca. 20 km al SW de Mavaca, Serranía del Vinilla, 760 m, *Huber 6164* (US); sabana en la margen derecha del bajo Río Pasimoni, 8 Feb. 1981, *Huber & Medina 5855* (VDB, VEN); 9 km NE San Carlos, 120 m, 26 Nov. 1977, *Liesner 3913* (MO, NY, VDB); ríos Pacimoni, Yatua, Casiquiare, 110 m, 28 Sep. 1957, *Maguire et al. 41629* (GH, NY, VEN); Triana Savanna, Cerro Pitón, *Maguire et al. 53595* (NY); Bruno (Guaibana), Iaja de roca ignea, 100 m, 9 Apr. 1970, *Steyermark & Bunting 102490* (F, US, VDB, VEN); terreno arenoso en el camino de Yavita, 128 m, 26 Jan. 1942, *L. Williams 13996* (F, US, VEN). BOLÍVAR: savana bordering forest of Río Karuai, between Kavanayen and base of Ptari-tepui, 1,220 m, 18 Nov. 1944, *Steyermark 60603* (F, NY, VEN).

Perhaps the smallest, certainly the most slender, species of *Xyris*, very easily overlooked among the masses of other weedy *Xyris* of open savanna.

46. Xyris connosepala Lanj. & Lindeman, Bull. Torrey Bot. Club 75: 639. 1948. TYPE: Surinam: Tafelberg (Table Mountain). Frequent, wet sphagnum-filled cracks in rocks, Savanna No. IV, 16 Aug. 1944, *B. Maguire 24395a* (holotype, NY; isotype, U). Figure 46.

Delicate, cespitose, rosulate, smooth annual 1–2 dm high. Leaves spreading-ascend-

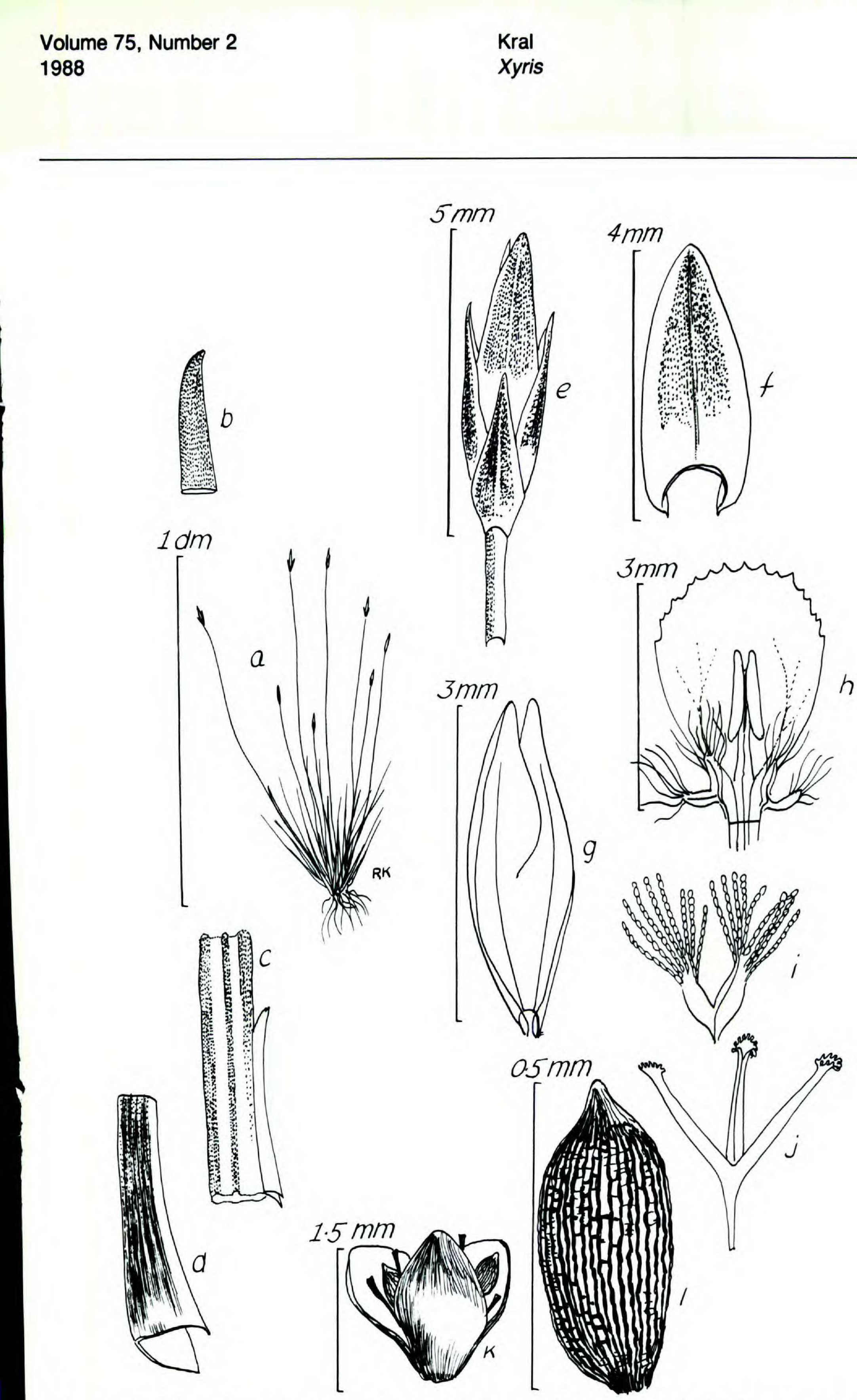


FIGURE 45. Xyris subuniflora (Davidse et al. 16928).—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepals (inside view).—h. Petal blade, corolla showing attachment of two staminodes.—i. Staminode.—j. Stylar apex.—k. Dehisced capsule.—l. Seed.*

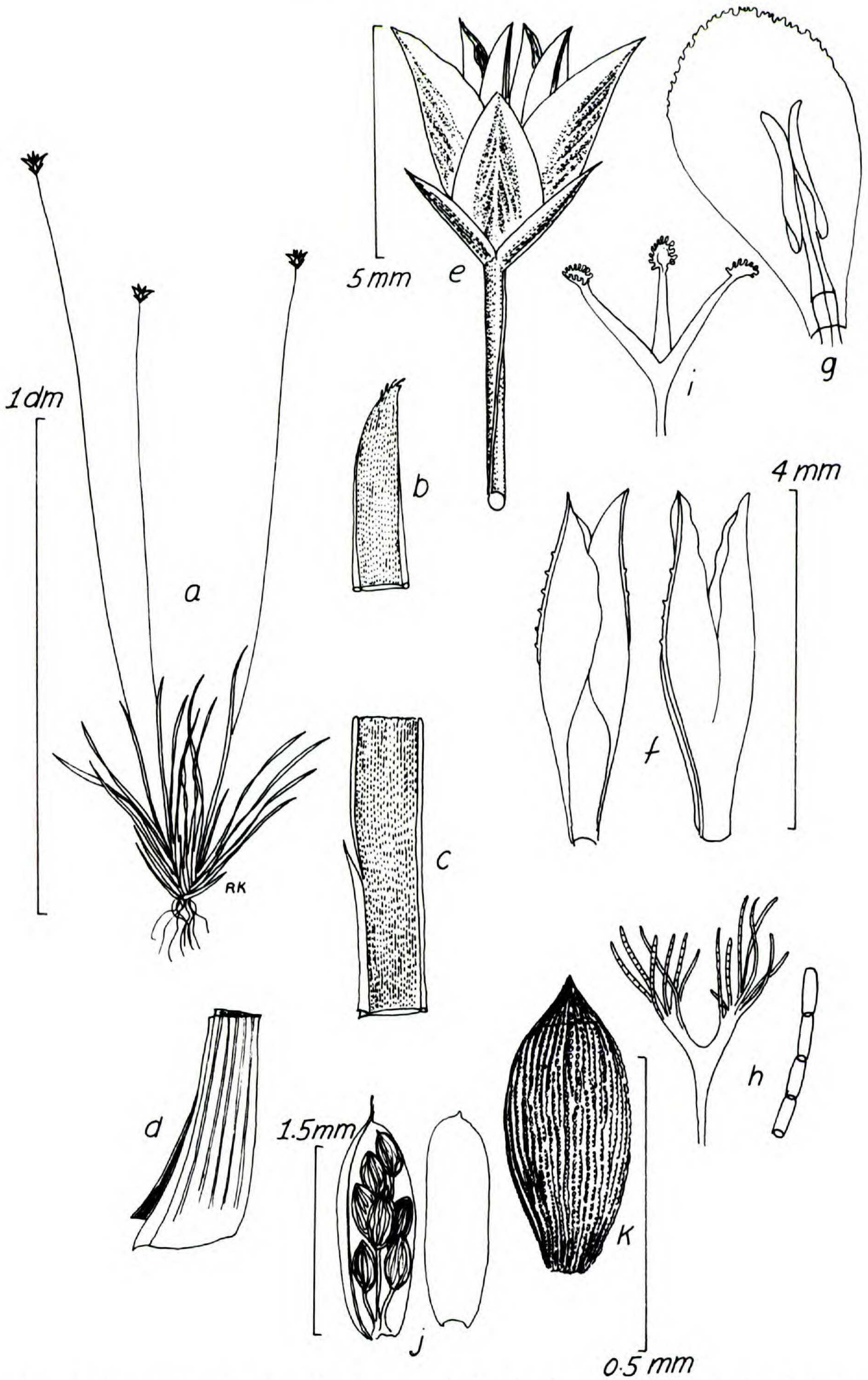


FIGURE 46. Xyris connosepala *(from the type)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf at sheath–blade junction.—d. Leaf base.—e. Spike.—f. Lateral sepals, front and back view.—g. Petal, stamen.—h. Staminode.—i. Style apex.—j. Capsule, at left open to reveal placenta, at right a valve.—k. Seed.*

ing, 2–5 cm long; sheaths reddish brown, ca. ½ as long as blades, tapering evenly from keeled base to blade, or with an erect, narrowly triangular ligule to 0.5 mm long; blade flat, linear, often twisted, 0.8–1.2 mm wide, the apex incurved-acute, slightly thickened, papillose-tipped, the margin a narrow, pale, cartilaginous band, the surface green or maroon, finely nerved. Scape sheaths ca. the same length as leaves, proximally tubular, multicostate, opening toward middle, at apex bearing a blade similar to that of leaves. Scapes filiform, maroon, terete, with 1 low but strong costa. Spikes ellipsoid, in fruit broadly obconic, ca. 0.5 mm long, red-brown, of 2–3 flowers. Sterile bracts ca. 4, decussate, triangular-ovate, keeled, smaller than and grading into the fertile bracts, these 3–4 mm long, ovate, acute, entire, the backs ecarinate, with prominent lanceolate dorsal areas, excurved in fruit. Lateral sepals ca. 4 mm long, connate in basal ⅓, the lobes subequilateral, oblong, acute, pale brown, firm, keel in middle ⅓ papillate-tuberculate. Petal blades broadly obovate, 3 mm long, yellow, the narrowly rounded apex erose. Staminodia bibrachiate, the flattened branches with sparse penicillate hairs distally. Anthers oblong, ca. 1 mm long, deeply bifid apically, auriculate basally, on filaments ca. 0.5 mm long. Capsule ellipsoid, ca. 1.5 mm long, placentation central. Seeds numerous on elongate funicles, ellipsoid, ca. 0.5 mm long, biapiculate, deep brown, many-ribbed longitudinally.

Distribution. Rocky moist savanna, known only from the type locality (additional material, *Kramer & Hekking 2940*, U).

This species is so similar to the widespread *X. guianensis* as to make the observer doubt their distinctness. However, until more collections from the region show intermediacy in sepal connation, it is perhaps best to include it here as distinct.

47. Xyris guianensis Steudel, Syn. Pl. Glum. 2: 285. 1855. TYPE: Guayana: "Guiana anglica. *Schomburghk No. 1038*" (lectotype, K; isolectotypes, K, L). Figure 47.

Xyris gardneri Malme, Bih. Svensk. Vet. Akad. Handl. 26, Afd. 3(19); 8, pl. 1, f. 1. 1901 (lectotype, S; isolectotype, NY).

Xyris filiscapa Malme, Repert. Spec. Nov. Regni Veg. 3: 112. 1906. TYPE: Brazil. Amazonas: "In arenosis humidis, Manaos, Amazonas, Brasil," *Ule 6172* (lectotype, S; isolectotypes, L, NY, US).

Low, densely tufted, smooth annual 0.5–3 dm high, the stems mostly contracted, sometimes 1–2 cm long. Principal leaves spreading flabellately, often maroon or red-brown, 2.5–7 cm long; sheaths entire, glossy red-brown, ½ the blade length or less, keeled, the keel often papillate-ciliolate, incrassate, tapering gradually to blade, there often with a scarious, narrowly triangular, erect, ligule to 2 mm long or eligulate, the blades flattened, linear, often twisted, 0.5–1 mm wide, the apex narrowly acute to acuminate, the tip sometimes with a tuft of scabrosity, the margins narrow, incrassate, a pale or dark, smooth band, the surfaces finely multinerved and smooth, often with strong maroon tints. Scape sheaths longer than to slightly shorter than leaves, below terete and deep glossy red-brown, distally opening and keeled, producing a blade similar to leaf. Scapes filiform, twisted, sometimes flexuous, ca. 0.5 mm thick, distally terete or slightly compressed, ecostate to low-bicostate, the costae smooth. Spikes ellipsoid, drying obovate or turbinate, 4–7 mm long, pale red-brown with 2–3 (rarely a few more) florets; bracts few, decussate, with strong, green or maroon, lance-ovate dorsal areas bisected by a strong midnerve; sterile bracts mostly 4, the lower pair triangular, keeled, slightly shorter and narrower than the inner pair, the fertile pairs again slightly longer or equal to inner sterile pair, oblong, ca. 4.5–5 mm long, less keeled, more often convex-rounded or rounded-navicular, apically narrowly to broadly rounded, entire, scarious-bordered, the narrow tips often villosulous-ciliate. Lateral sepals pale red-brown, thin, subequilateral, oblanceolate, 4–5 mm long, acute, the narrow, firm keel papillate or ciliolate above middle, or the keel smooth.

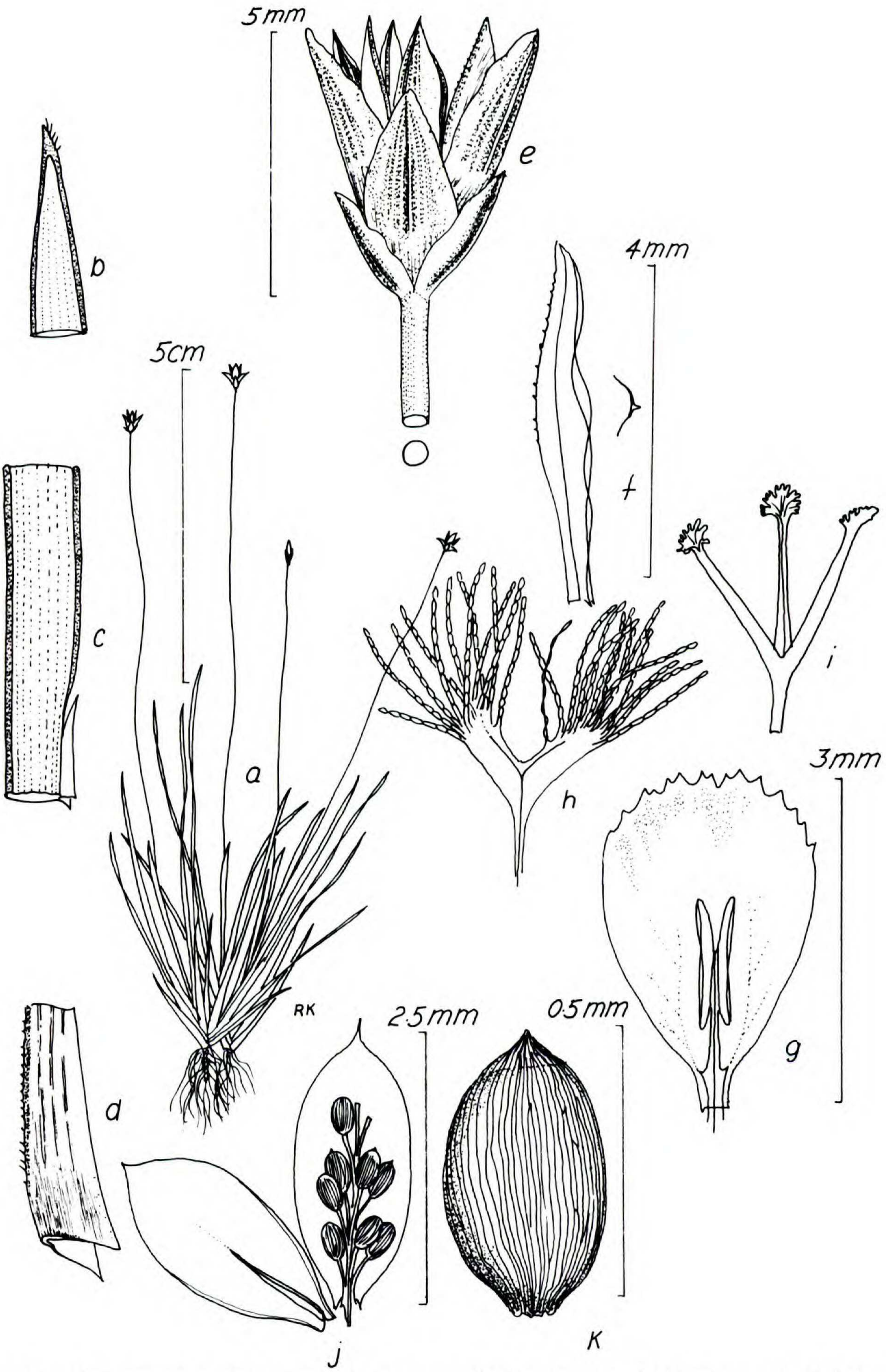


FIGURE 47. Xyris guianensis (Steyermark 75771).—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule spread to show two of the three valves and placentation.—k. Seed.*

Petal blades broadly obovate, ca. 3 mm long, yellow, the broadly rounded apex lacerate-dentate. Staminodia bibrachiate, the broad, thin branches penicillate-ciliate. Anthers oblong, ca. 1 mm long, deeply bifid and sagittate, on filaments ca. 0.5 mm long. Capsule ellipsoid, ca. 2.5 mm long, the placentation basal-central, the valves with narrow septa below the middle. Seeds numerous, ovoid to ellipsoid, ca. 0.5 mm long, apiculate, dark amber, lustrous, finely ribbed longitudinally.

Distribution. Locally abundant in low- to medium-altitude savanna, southeastern Colombia eastward into Surinam and in adjacent Brazil south into Goiás.

Selected specimens examined. COLOMBIA. AMAZONAS–VAUPÉS: Río Apaporis, Raudal de Jirijirimo, ca. 900 ft., 12 Aug. 1951, *Schultes & Cabrera 13506* (GH). VAUPÉS: Cerro Yapoboda, Río Kuduyarí, ca. 450 m, 5–6 Oct. 1951, *Schultes & Cabrera 14379-B* (GH); Río Kubiyú, Cerro Kanenda ca. 15 mi. up from mouth, 800–900 ft., 10 Nov. 1952, *Schultes & Cabrera 18348* (F, MG, US); Río Vaupés, ca. 800 ft., 20 Apr. 1953, *Schultes & Cabrera s.n.* (GH); same locality, 20 Apr. 1953, *Schultes & Cabrera 19200* (U). GUYANA: Saesdike, Nov. 1973, *Cooper 208* (U); Kaieteur Plateau, 3 May 1944, *Fanshawe* (K, U). SURINAM: savanna inter Zanderij I et Hannover, opn. 125, 8 Oct. 1958, *J. & W. A. E. van Donselaar 363* (U); prope km 103, opn. 308, Gros-savanna, 30 Apr. 1959, *J. van Donselaar 694* (U); Boven Coesewijne, savanne in lijn 5–6 van exploratie 860, 16 May 1956, *Heyligers 14* (U); prope jodensavanne (Fluv. Suriname) tr. 30, p. 74, 30 Mar. 1976, *Heyligers 802* (U); savanne tussen Paranam en Phedra, 5 Feb. 1961, *Kramer & Hekking 2854* (U); Zanderij I, 4 Sep. 1948, *Lanjouw & Lindeman 161* (U); via secta ab Moengo tapoe ad Grote Zwiebelzwamp, ridge E of Camp 14.9, 20 Oct. 1948, *Lanjouw & Lindeman 928* (K, U); Tibiti Savanne, near km 3.2–4, line 2, 11 Jan. 1949, *Lanjouw & Lindeman 1791* (U); near Sapende, upper Commewijne River, 14 July 1953, *Lindeman 4232* (U); Iter secundum Surinamense, pr. Zanderij I, July–Sep. 1920, *Pulle 58* (U); Zanderij, 28 June 1970, *Teunissen LBB 12761* (U); "Suriname" C. Weigelt, from *Schweinitz Herb.* (PH); Nat. Res. "Brinckheuvel," 2 Sep. 1967, *Wilschut & Teunissen 11588* (U). VENEZUELA. T. F. AMAZONAS: alrededores de Yavita (Río Temi), 6–19 July 1969, *Bunting et al. 3714* (MY, NY, U, VDB); Santa Cruz margen del Río Atabapo, 4 Sep. 1960, *Foldats 3689* (NY, VEN); del raudal "Moriche" en el Río Guayapo, 10 May 1983, *Guánchez 3100* (TFAV, VDB); campina near abandoned Petrobras airstrip, mun. Borba, 7 July 1983, *Hill et al. 12975* (MO, NY, VDB); 5 km al N de la punta E del Cerro Yapacana, 28 June 1979, *Huber 3903* (US); 2 km al W de San Antonio del Orinoco, 20 July 1980, *Huber & Tillett 5423a* (VEN); a unos 15 km al N del Cerro Yapacana, 27 July 1980, *Huber & Tillett 5557* (MYF, VDB, VEN); granite outcrop 30 km below La Urgana, 100 m, 14–15 Mar. 1949, *Maguire 29084* (NY, US); Cerro Duida, Río Cunucunuma, along Caño Culebra, 1,000–1,100 m, 18 Nov. 1950, *Maguire et al. 29520* (NY, US); Santa Cruz, small village on Río Atabapo, 17–18 Nov. 1979, *Thomas & Rogers 2688* (NY); Cerro Duida immediatamente N de La Esmeralda, ca. 1,350 m, 29 Jan.–11 Feb. 1975, *Tillett et al. 751-93* (K, MYF, NY, US, VEN); Yavita, 128 m, 26 Jan. 1942, *L. Williams 13996* (F); near Yavita, 10 June 1959, *Wurdack & Adderley 42921* (GH, US, VEN). BOLÍVAR: Salto Camá, ca. 1,000 m, 4 Dec. 1973, *Davidse et al. 4864* (MO); 15 km al NW de Uiaren, *Huber et al. 7602* (MYF, VDB); Macizo del Chimantá, 2,000 m, 26–29 Jan. 1983, *Huber & Steyermark 6874* (VEN); 15–20 km S del empalme Luepa–Kavanayen, *Huber et al. 7252* (MYF); sector SSE altiplanicie suroriental del Acopan-tepui, 13–16 Feb. 1984, *Huber et al. 9012* (NY, VDB, VEN); Macizo del Guaiquinima, 1,350 m, 2 Apr. 1984, *Huber 9365* (MYF, VDB); La Escalera, ca. 7 km N of Pioneer Monument, ca. 1,200 m, 24 July 1983, *Kral 70316* (BM, F, K, L, MO, NY, SP, U, US, VDB, VEN, & others); above El Salto Yuruani, Río Yuruani, *Kral 70571* (MO, NY, US, VDB, VEN); 8 km N of San Rafael, Gran Sabana, 29 July 1983, *Kral 70575* (MO, NY, US, VDB, VEN); ca. 2 km N of Luepa, 20 Dec. 1984, *Kral 72206* (MYF, VDB, VEN); 17 km E of El Pauji, 30 Oct. 1985, *Liesner 19215* (MO, VDB, VEN); Cerro Guaiquinima, 1,600–1,700 m, 4 Jan. 1952, *Maguire 32983* (GH, K, NY, US); Salto Acarima, Río Uriman, 9 Jan. 1955, *Steyermark & Wurdack 44* (NY, US); Roraima, Glycon Swamp & vic., 1,830–1,920 m, 25 Sep. 1944, *Steyermark 58630* (F, NY); Cumbre de Auyan-tepui, sector oriental, al norte de la Misión de Camaratá, 2,140 m, 28 Feb 1978, *Steyermark et al. 116133* (MO, VDB, VEN).

Examination of the type of *X. filiscapa* Malme reveals that this differs in no significant way; that is, a broad range of specimens of *X. guianensis* shows sepal keels varying from entire to ciliolate and leaf blade margins ranging from strongly to weakly incrassate bordered. Elements of the former described as having ciliate sheaths are either ciliate-keeled *X. guianensis* or ciliate-leaf-sheathed *X. tenella* Kunth (*X. steyermarkii* Maguire & Lyman B. Smith). Therefore Colombian material identified as *X. filiscapa* turns out to be *X. guianensis*.

48. Xyris spathacea Lanj., Pulle, Rec. Trav. Bot. Neerl. 34: 484, fig. 4. 1937. TYPE: Surinam: "Sanderij I, Sept. 1914, Leg. *Essed*" (holotype, L; isotype, U). Figure 48A, B.

Xyris exserta Idrobo & Lyman B. Smith, Caldasia 6: 229, f. 21. 1954. TYPE: Colombia. Vaupés: sands

in rapids, Río Guaimia, Caño del Caribe near San José, 850–900 ft., 2 Nov. 1953, *R. E. Schultes, R. E. D. Baker & Is. Cabrera 18276* (holotype, COL; isotypes, GH, US).

Xyris yapobodensis Idrobo & Lyman B. Smith, Caldasia 6: 231–232, fig. 22. 1954. TYPE: Colombia. Vaupés: "elevated sandstone savanna known in Kubeo as 'Yapoboda,' Alto Cuduyari, ca. 400 m. alt." 10 Dec. 1943, *P. H. Allen 3287* (holotype, MO).

Mostly low, slender, soft-based, solitary or cespitose, sometimes short-rhizomed ephemerals (5–)10–30 cm high. Leaves erect or spreading, dimorphic, those of dry stages or of innovations 0.5–5 cm long, with sheaths over ½ as long to longer than blades, the broad, scarious margins abruptly converging distally to the short, terete, 0.2–2.5 mm thick, conic-tipped, stiff, often maroon blades, also often producing apically a scarious, triangular or oblong ligule 2 mm long; "wet" or submersed-stage leaves lax, flaccid, filiform, mostly 1–2 dm long, the thin sheaths much less than ½ as long as blades, pale brown or stramineous, sparsely costate, tapering gradually from base to blade, there with a scarious, narrowly triangular ligule to 3 mm long, the blades terete or at intervals somewhat flattened, ca. 0.3 mm thick. Scape sheaths loosely tubular, much raised above the "dry"-season foliage, shorter than the lax "wet"-phase leaves, twisted and fluted, multicostate, distally open, carinate, producing a short, cusplike blade. Scapes soft, filiform, straight or slightly flexuous, slightly twisted, terete, striate, 0.3–1 mm thick, ecostate. Spikes elliptic to obovoid, 3–5 mm long, sometimes proliferous, acute, 2–4-flowered, of a few spirally arranged, scarious-bordered, loosely imbricate bracts with distinct, elliptic-ovate, brown to green, papillose dorsal areas over ½ as long as the bract body; sterile bracts 3–4, narrowly ovate, slightly shorter than the fertile bracts and grading into them, the two lowest keeled, navicular, subacute; fertile bracts broadly elliptic to obovate, ca. 3 mm long, subacute, the margins sometimes white-villosulous-ciliate at apex, the backs rounded-convex, ecarinate, the dorsal areas bisected by a narrow but distinct midnerve. Lateral sepals free, subequilateral or somewhat inequilateral, lanceolate to linear-oblanceolate, ca. 3–3.5 mm long, acute, the broad, low keel sparsely papillose or short-ciliate from middle to apex. Petal blades obovate, 3–3.5 mm long, yellow, the broadly rounded apex lacerate-dentate. Staminodia bibrachiate, the broad, flat branches copiously penicillate apically. Anthers oblong, ca. 1 mm long, bifid to below middle, sagittate, on filaments ca. 0.6–0.7 mm long. Capsule short-cylindric to narrowly obovate, ca. 2.5 mm long, the placentation basal, the valves without septa. Seeds numerous on long funicles, ellipsoid, 0.4–0.5 mm long, pale brown, translucent, with an irregular, coarse, partly anastomosing retinaculum of a few strong, deep brown ribs.

Distribution. Locally abundant in low, riverine and intermittently inundated savannas, southeastern Colombia, southern Venezuela, eastward to Surinam and contiguous Amazonian Brazil (Amazonas, Mato Grosso, Pará).

Additional specimens examined. BRAZIL. AMAZONAS: basin of Rio Negro, Rio Uneiuxi, 5 km above mouth, 8 Nov. 1971, *Prance et al. 16183*, with nom. nud. "*X. prolifera* K. & S." (NY, US, VDB). MATO GROSSO: Serra do Roncador, Mun. Barra do Garcas, *G. & L. T. Eiten 8572* (MO, VDB). COLOMBIA. VAUPÉS: types of *X. exserta* and *X. yapobodensis* constituting all known records thus far. SURINAM: Zanderij, d.d. Aug. 1958, *van Donselaar et al., s.n.* (U); Zanderij I, savannah, Aug. 1914, *Essed 112a* (U); prope Jodensavanne, 12 June 1957, *Heyligers 818* (U); Zanderij I, savanna, 4 Sep. 1948, *Lanjouw & Lindeman 109* (U); same locality, 9 Sep. 1948, *Lanjouw & Lindeman 224* (submersed phase) (U); via secta ab Moengo tapoe ad Grote Zwiebelzwamp near km 6.6, 29 Sep. 1948, *Lanjouw & Lindeman 581* (U); Tibiti savanne near km 5.8, 15 Jan. 1949, *Lanjouw & Lindeman 1854a* (U); E of Kopie Peninica R, distr. Commewijne, 16 July 1953, *Lindeman 4375* (U); Zanderij in savanna pool half underwater, *Lindeman 4483* (C); Zanderij, almost dry pool along rd. to old radio station, 22 Nov. 1953, *Lindeman 5068* (NY, U, VDB); Sipaliwini savanna on Braz. frontier, 305 m, 4 km S of "4-Gebroeders" mts., *Oldenburger et al. 188* (U); Zanderij, pool edge, 25 Jan. 1942, *G. Stahel s.n.* (GH, U). VENEZUELA. T. F. AMAZONAS: "Fundo Galletti" Reserva forestal del Río Sipapo, 2 Feb. 1983, *Guánchez 2416* (TFAV, VDB); el medio Caño Yagua y al N del Cerro Cucuritu, 120 m, 18 Jan. 1979, *Huber 3122* (US); a la orilla derecha (W) del Alto Caño Yagua, 18 Feb. 1979, *Huber 3185* (NY); borde del alto Caño Yagua, 28 Feb. 1980, *Huber 4818* (US, VDB, VEN); Savanna II, fls. open in late morning, between Caño Cotua & W base Cerro Yapacana, 100 m, 10 Aug. 1983, *Kral & Huber 70703* (VDB, VEN, and to be distributed).

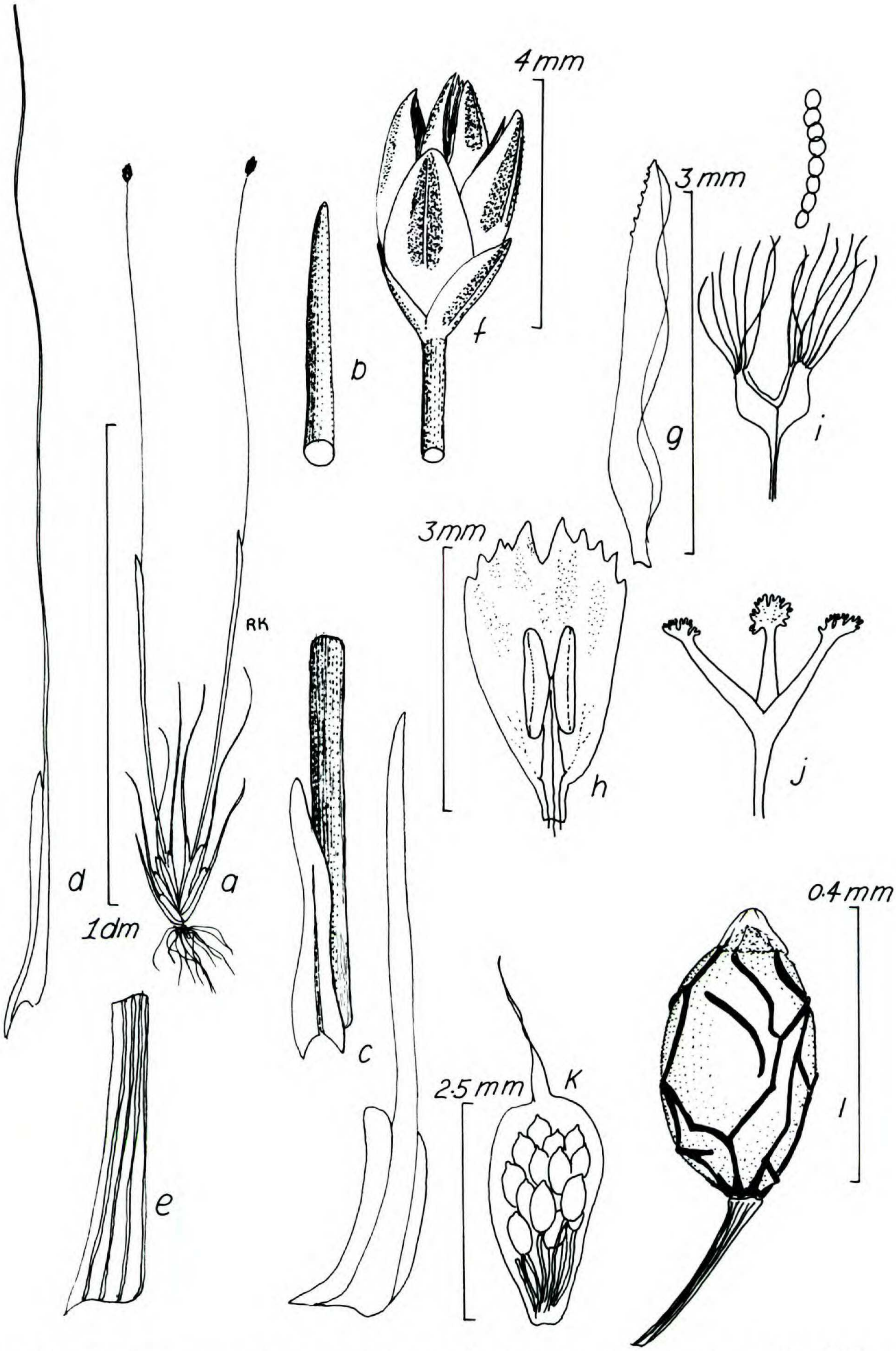


FIGURE 48A. Xyris spathacea *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule, median.—l. Seed.*

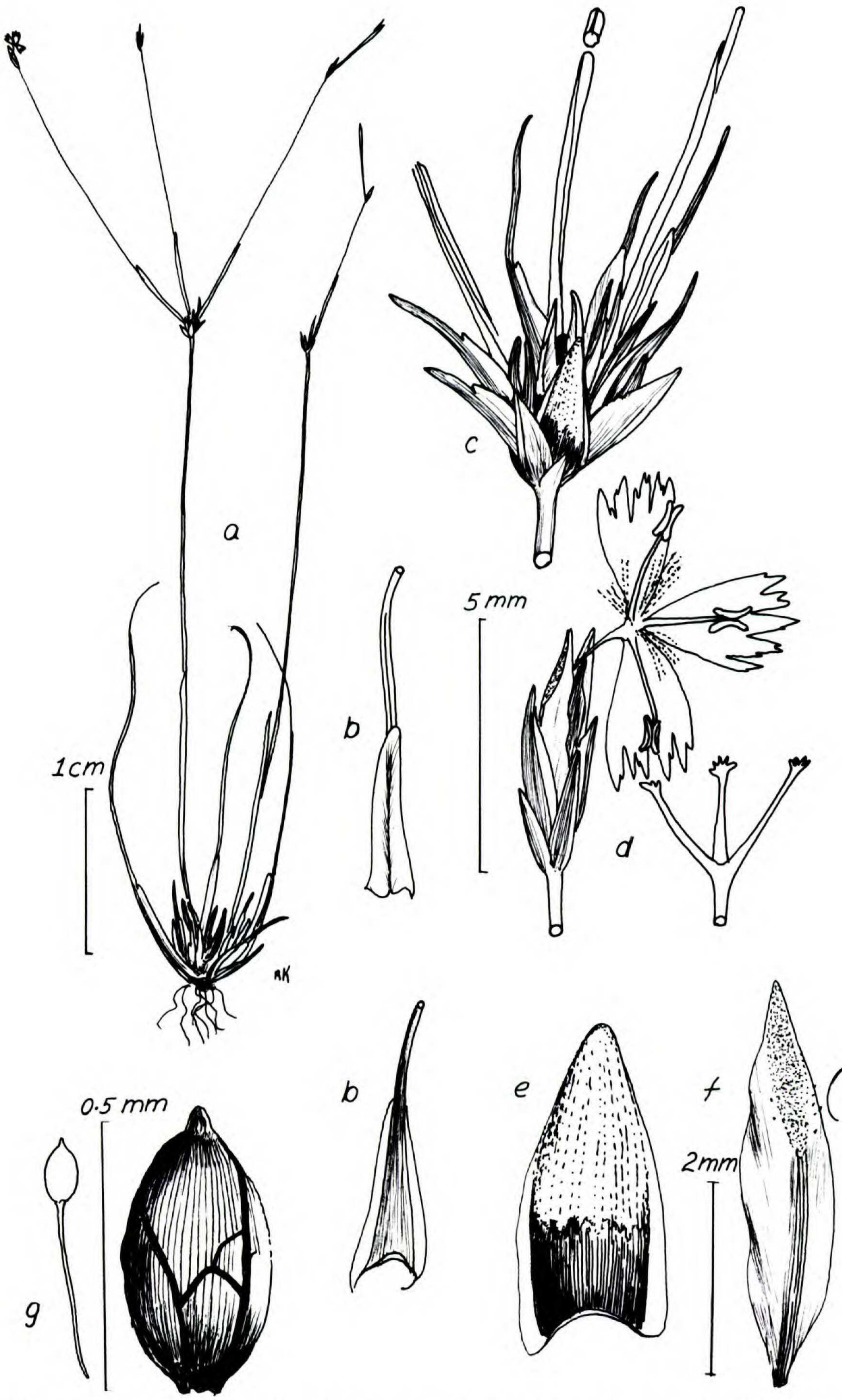


FIGURE 48B. Xyris spathacea *(*Huber 3185*)*.—*a. Habit sketch.—b. Leaf sheath–blade junction.—c. Spike, showing exserted sepals, proliferous habit.—d. Spike, flower, stylar apex.—e. Fertile bract.—f. Lateral sepal.—g. Seed.*

This species has a low stature and very short leaf blades when developing on drying sites left by retreating waters. On the other hand, such plants produce much longer, laxer leaves when water rises to submerse them or their bases. I find no way to distinguish material of *X. spathacea* (Fig. 48A) from what is being called *X. exserta* (Fig. 48B) from the upper Amazon Basin of western Brazil and from the low savanna of Venezuela and Colombia. The only difference that is of any real interest is the tendency toward proliferative spikes in the latter, doubtlessly this trait induced environmentally. Some such Venezuelan and Brazilian extremes produce strong branches (scapes) that radiate umbel-like from the primary spike and terminate in floriferous spikes (*Huber 3185*, *Prance et al. 16183*). The type of *X. exserta* differs not at all from longer-leaved *X. spathacea* from Surinam.

49. Xyris cyperoides Gleason, Bull. Torrey Bot. Club 56: 17. 1929. TYPE: Guyana: Kaieteur Savanna, Potaro River, Sep.-Oct. 1881, *G. S. Jenman 1056* (holotype, K). Figure 49.

Xyris epicarae Kral & Smith, Phytologia 53: 436–437, fig. 6. 1983. TYPE: southeast escarpment of Cerro Pitón, 400 m, Cordillera Epicara, Río Chicanan, 5 Sep. 1962, *B. Maguire et al. 53651* (holotype, VEN; isotypes, NY, US, VDB).

Densely cespitose, the firm, pale reddish brown bases covered by persistent old leaf bases, the stems short to somewhat elongated, erect or ascending; roots slender. Principal leaves subdistichous, erect, twisted, flexuous, 0.8–1.8 dm long, longer than the scape sheaths (and often the scapes themselves); blades 5–6 times longer than sheaths, filiform, angulate to terete or somewhat compressed, 0.2–0.4 mm wide, longitudinally strongly nerved, shining, smooth with nerves reddish brown, wider than the greenish intervals; tips gradually narrowed, fimbriolate with clavate trichomes at apex; margins entire or minutely scabrid toward base; sheaths ecarinate, entire, strongly multicostate, smooth, gradually dilating to base, producing an acute, scarious ligule to 1.5 mm long at apex. Scape sheaths similar to leaves but shorter. Scapes filiform, 1.5–2 dm long, 0.3–0.4 mm wide, slightly twisted and flexuous, terete, finely 1–several-costate, olivaceous, smooth. Spikes 2-flowered, ellipsoid or in mature state obconic, ca. 4 mm long; bracts loosely imbricate, decussate, triangular-ovate, mostly 6, smooth, pale lustrous reddish brown, sparsely ciliate toward apex, marginally scarious; sterile bracts 4, unicostate, the lowest pair lanceolate, ca. 2.5 mm long, cymbiform, the inner pair triangular-ovate, ca. 3 mm long, ecarinate; fertile bracts ovate, ca. 3 mm long, strongly convex or navicular, at length excurvate; dorsal area olive, then ferrugineous, conspicuous, large, nearly as long as bract. Lateral sepals oblong, ca. 3.5 mm long, slightly curvate, subequilateral, obtuse and slightly emarginate to acute; keel narrow, entire. Petal blades obtriangular, ca. 3 mm long, yellow, subtruncate at apex, erose. Staminodia bibrachiate, the branches sparsely penicillate apically. Anthers oblong, 1.2 mm long, deeply bifid and sagittate, on filaments ca. 1 mm long. Capsule ellipsoid, ca. 2 mm long, the valves without septa, the placentation central. Seeds numerous, broadly ellipsoid, ca. 0.5 mm long, amber, finely longitudinally multiribbed.

Distribution. Sandy, medium- to high-elevation savanna, apparently rare, from southern Estado Bolívar, Venezuela southward into contiguous Amazonas, Brazil and eastward to Surinam.

Additional specimens examined. BRAZIL. AMAZONAS: Manaus–Caracarai Highway, forest at km 130, *Steward et al. P20348* (specimen bearing nomen nudum *X. sulcata* (US). GUYANA: Kaieteur Plateau, along Mure-mure Creek to ca. 3 mi. above mouth, ca. 1,400 ft., 15–16 Mar. 1962, *Cowan & Soderstrom 2179* (US). SURINAM: Kappel savanna, Tafelberg, 300 m, Natte struik-savanne in het Z. deel, 23 Feb. 1961, *Kramer & Hekking 3308* (U). VENEZUELA. BOLÍVAR: Cerro Pitón, 400 m, cordillera Epicara, Río Chicanan, 3 Sep. 1962, *Maguire & Steyermark 53563* (NY, VDB); same locality, 9–11 Sep. 1962, *Maguire et al. 53713* (NY, VDB); Cerro Guaiquinima, Salto del Río Szczerbanari, 1–2 km río arriba del Salto Szczerbanari, 750 m, 20–25 Jan. 1977, *Steyermark et al. 113116-A* (US, VDB, VEN); cumbre de Auyan-tepui, sector oriental, al norte de la Misión de

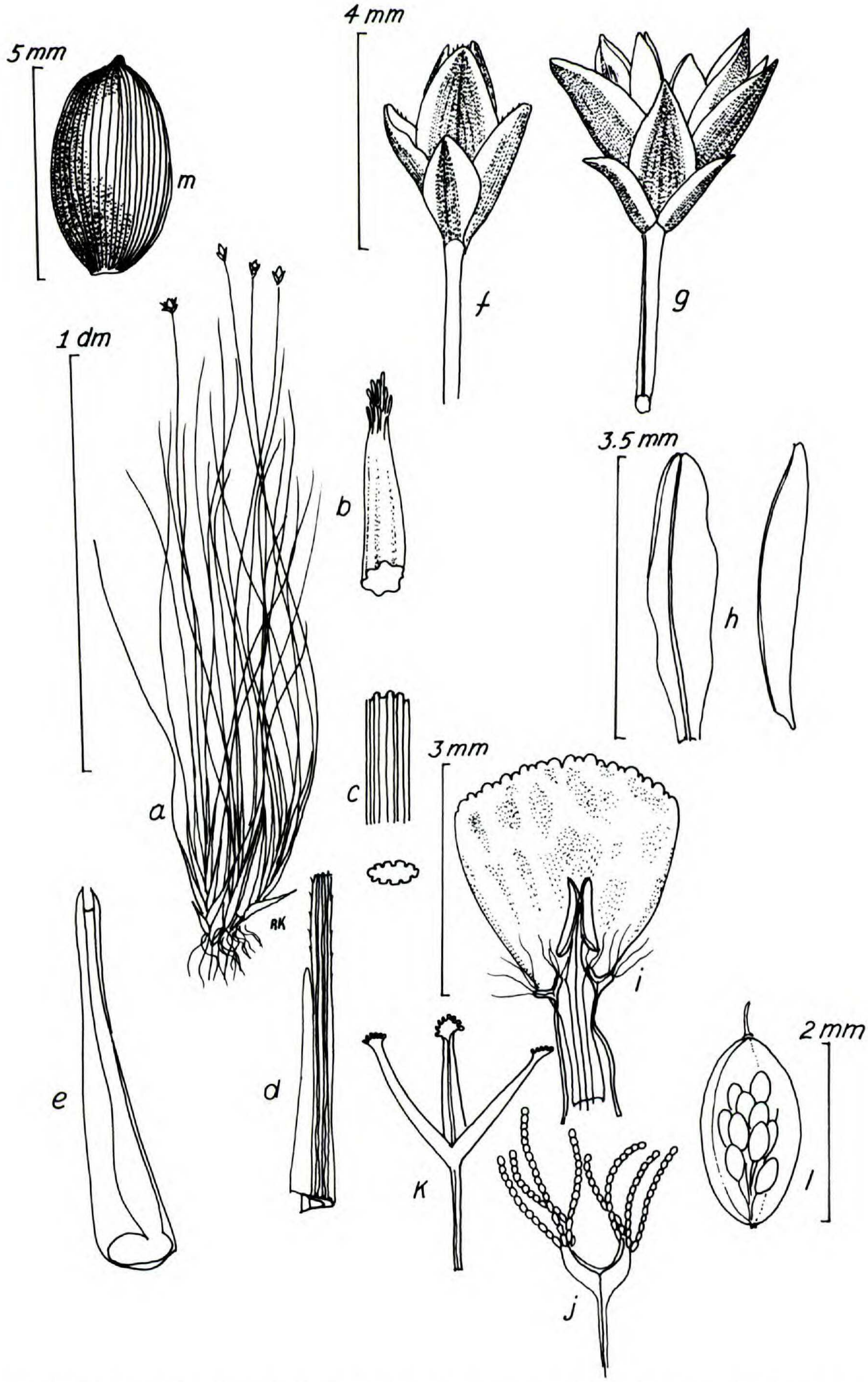


FIGURE 49. Xyris cyperoides *(from holotype of* X. epicarae*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf at midblade.—d. Leaf at blade–sheath junction.—e. Leaf base.—f. Spike at anthesis.—g. Spike past anthesis.—h. Lateral sepal.—i. Petal and stamen.—j. Staminode.—k. Stylar apex.—l. Capsule, one valve removed.—m. Seed.*

Camarata, 2,140 m, 28 Feb. 1978, *Steyermark et al. 116133* (MO, VDB, VEN).

In the spike this resembles *X. guianensis* Steud., but it is definitely longer-leaved in relation to scape, and the lateral sepal keels are entire.

50. Xyris toronoana Kral, sp. nov. TYPE: Venezuela. Bolívar: Distr. Piar, Macizo del Chimantá, sector centro-meridional. Amplio valle ubicado entre el borde nor-oriental del Torono-tepui y la sección central del Chimantá-tepui, drenando hacia el Sur, ca. 6°16′N, 62°09′W, ± 2,100 m, 11–15 Feb. 1985, *O. Huber, Teuvo Ahti & J. J. Pipoly 10,223* (holotype, VEN; isotypes, K, MYF, NY, US, VDB). Figure 50.

Herba humilis, perennis, glabris, caespitosa, rhizomate crassa, brevi, subverticali. Radices fibrosa. Folia linearis, (2–)4–7 cm longa, erecta vel leviter expansa, vaginis scaporum parum longiora. Laminae foliorum principalium compressae, planae vel leviter tortae, 0.9–1.2 mm latae, vaginis ca. 2-plo longiores, longitudine paucinervosae, atrovinosae; apices gradatim contracti, incurvato-acuti, leviter incrassati, ad marginem incrassati, papillosi; margines leviter incrassati, minute ciliati vel scabriduli; vaginae carinatae, integrae, eligulatae, stramineae, infime abrupte dilatatae, marginibus in laminas gradatim contractis. Vaginae scaporum multicostatae, laxae, tortae, laminis brevibus. Scapi recti vel aliquantum flexuosi, torti, 1.2–1.5 dm alti, olivacei, distaliter leviter compressi, ca. 1 mm lati, acute bicostati, costis scabridis. Spicae anguste obovoideae vel ellipsoideae, 5–7 mm longae, ferrugineae, pauciflorae, bracteis laxe imbricatis, distaliter minute papillosis, matricibus tenuibus, ad marginem valde laceratis, ferrugineis vel roseolis. Bracteae steriles 2–4, subdecussatae, ca. 5 mm longae, paro infimo anguste ovato, ca. 5 mm longo, valde carinato, areis dorsalibus anguste linearibus, paro intimo ovato, solum ad apicem carinato, areis dorsalibus brevilinearibus. Bracteae fertiles oblongae, ca. 4, 6–7 mm longae, naviculares, distaliter carinatae, areis dorsalibus linearibus, ca. 3 mm longis. Sepala lateralia libera, inaequilatera, anguste lanceolata, 5.5–6.5 mm longa, acuta, leviter curvata; ala carinali integra. Laminae petalorum angustae obovatae, ca. 5 mm longae, luteolae, anguste rotundatae. Staminodia bibrachiata, brachiis longipenicillatis. Anthera oblongae, sagittatae, 1.5 mm longae; filamenta ca. 0.7–1 mm longa. Capsula anguste ellipsoidea, 3 mm longa; placenta basalis. Semina numerosa, anguste ovoidea, acuminata, 0.6–0.7 mm longa, translucida, ferruginea, longitudine subtiliter multicostata.

Low, densely cespitose, smooth herb, the rhizome thick, short, subvertical; roots fibrous. Leaves linear, (2–)4–7 mm long, erect to slightly spreading, a little longer than the scape sheaths. Principal leaf blades flattened, sometimes slightly twisted, 0.9–1.2 mm wide, about twice as long as the sheaths, few-nerved, dark red-brown; tips gradually narrowed, incurved-acute, slightly thickened, the margins thickened, papillose; blade margins slightly thickened, minutely ciliate to scabridulous; sheaths carinate, entire, eligulate, stramineous, abruptly dilated below, the margins gradually narrowed into the blades. Scape sheaths multicostate, loose, twisted, short-bladed. Scapes straight or somewhat flexuous, twisted, 1.2–1.5 dm high, olivaceous, slightly compressed distally, ca. 1 mm wide, acutely bicostate, the costae scabrid. Spikes narrowly obovoid to ellipsoid, 5–7 mm long, ferrugineous, few-flowered, the bracts loosely imbricate, minutely papillose distally, the matrix thin, strongly lacerate at margin, ferrugineous or roseolate. Sterile bracts 2–4, subdecussate, ca. 5 mm long, the lower pair narrowly ovate, ca. 5 mm long, strongly carinate, with narrowly linear dorsal areas, the upper pair ovate, carinate only at apex, the dorsal areas short-linear. Fertile bracts oblong, ca. 4, 6–7 mm long, navicular, distally carinate, the dorsal areas linear, ca. 3 mm long. Lateral sepals free, inequilateral, narrowly lanceolate, 5.5–6.5 mm long, acute, slightly curvate; carinal keel entire. Petal blades narrowly obovate, ca. 5 mm long, yellow, narrowly rounded. Staminodia bibrachiate, the branches long-penicillate. Anthers oblong, sagittate, 1.5 mm long; filaments 0.7–1 mm long. Capsule narrowly ellipsoid, 3 mm long; placenta basal. Seeds numerous, narrowly ovoid, acuminate, 0.6–0.7 mm long, translucent, red-brown, finely ribbed longitudinally.

The low habit and the delicate, lacerate, thin bracts with narrow, dark dorsal areas would appear to put this species into the *X. tenella* complex. However, the sheaths are entire and long-ciliate, and the lateral sepals are entire and more inequilateral. The tufts of erect or ascending, thick rhizomes covered with leaf bases are distinctive. It is known from only the type locality.

51. Xyris aquatica Idrobo & Lyman B. Smith, Caldasia 6: 206, fig. 9. 1954. TYPE: Colombia. Amazonas: on rocks in swift brook, Río Caquetá, vic. La Pedrara, Apr. 1924, *R. E. Schultes 5855* (holotype, COL; isotypes, GH, US). Figure 51.

Slender, lax, glabrous, soft-based, cespitose and profusely slenderly, scaly-rhizomatous perennial, 3–5 dm high but usually bent and trailing in rapid shoalwater. Leaves very soft, variously elongate, to 3 dm long, polystichous, the sheath less than ½ as long as the blade, the margins entire, the base lustrous pale brown or greenish brown, ecarinate, dilated, narrowing gradually upward to a prominent, narrow, scarious ligule to 6 mm long, there abruptly contracted to a terete, filiform, fluted blade up to ca. 0.5 mm thick. Scape sheath inflated-tubular, tan, opening distally to a bifid or acute apex, bladeless. Scapes straight or slightly flexuous, terete, 1–1.5 mm thick, ecostate. Spikes ovoid, narrowly ellipsoid or cylindric, 1–1.5 cm long, blunt, of many spirally imbricate, brown bracts, the sterile bracts several, ovate, slightly smaller than and grading into the fertile bracts, these oblong to obovate, ca. 5 mm long, broadly rounded, entire, backs rounded-folded, ecarinate, with ovate-elliptic, greenish dorsal areas. Lateral sepals free, curvate, subequilateral, linear-oblanceolate, 4–5 mm long, acute, lustrous brown with a narrow, dark, firm keel, this scabrociliate from below middle to apex, or subentire. Petal blades obovate, ca. 5 mm long, the broadly rounded apex erose. Staminodia bibrachiate, the branches lineal, densely penicillate-pubescent from base to tip. Anthers oblong, ca. 1.5 mm long, the upper ⅓ bifid; filaments ca. 2 mm long. Capsule obovoid, ca. 2 mm long or longer; placentation basal-central; valves eseptate. Seeds numerous, ovoid, ca. 0.5 mm long, apiculate, reddish brown, translucent, finely irregularly longitudinally striate or subreticulate by anastomosing ribs.

Distribution. A true aquatic, usually in shallow rapid shoalwaters of streams in the Amazon Basin of northern Brazil, southeastern Colombia, and T. F. Amazonas in Venezuela.

Additional specimens examined. BRAZIL. AMAZONAS: Mun. Humaitá, estrada Humaitá—km 150, a 65 km ao Sul, rio de nome Branco, *L. O. A. Teixeira et al. 1370* (INPA, NY, VDB); Rio Purus, Rio Ituxi, Rio Curuquetê, São Paulo, 30 km above mouth of Río Coti, 20 Jul 1971, *G. T. Prance et al. 14460* (INPA, NY, VDB); Rio Marmellos, Aug. 1948, *Schultes & López 10307* (US). COLOMBIA. VAUPÉS: Río Piraparaná (trib. of Río Apaporis), Caño Paca, 19 Sep. 1952, *Schultes & Cabrera 17565* (GH, U); Río Paraná Pichuna, ca. 700 ft., June 1953, *Schultes & Cabrera 19908* (NY). VENEZUELA. APURE: 9 km N of Caño Cochina de la Pica, along main rd. between Río Cinaruco and Río Capanaparo, 80 m, 2 Mar. 1979, *Davidse & Gonzalez 15992* (MO). T. F. AMAZONAS: entre el Río Sipapo y El Venado, 25 Nov. 1977, *A. Fernandez 2887* (F, MY); en lajas con caño de morichal de los alrededores de El Sipapo, ca. 100 m, lugares abiertos en carretera hacia el Sipapo, 22 Mar. 1979, *Trujillo & Pulido 15089* (MY); islas del Río Cataniapo en el Raudal Rabipelado a unos 35 km al sur-este de Puerto Ayacucho, 6 Mar. 1981, *Guánchez 904* (MYF, TFAV, VDB, VEN).

One of the few truly aquatic *Xyris*, the whole plant is apparently often totally submersed. Nearest it morphologically are *X. apureana* Kral & Lyman B. Smith and *X. spathacea* Lanjouw, but these usually have smaller spikes, often flatter leaf blades, and larger seeds.

52. Xyris apureana Kral & Lyman B. Smith, Ann. Missouri Bot. Gard. 69: 412–414, fig. 1a–i. 1982. TYPE: Venezuela. Apure: Dist. Pedro Camejo, ca. 2 km S of Caño la Cochina de La Pica along main road south of Paso de San Pablo to the Río Cinaruco, 70 m, 2 Mar. 1979, *G. Davidse & A. C. Gonzalez 15948* (holotype, US; isotypes, MO, VDB, VEN). Figure 52.

Perennial, lax, densely cespitose, smooth herb. Rhizomes slender, short to elongate, ascending (relating to degree of depth in substrate). Roots slender. Leaves linear, 1.5–3 dm long, erect or slightly spreading, subdistichous, longer than the scape sheaths; blades 5–10 times longer than sheaths, 1–2 mm wide, flat, straight, longitudinally few–many-nerved and sulcate, flattened from base to middle, terete or subterete toward apex, the

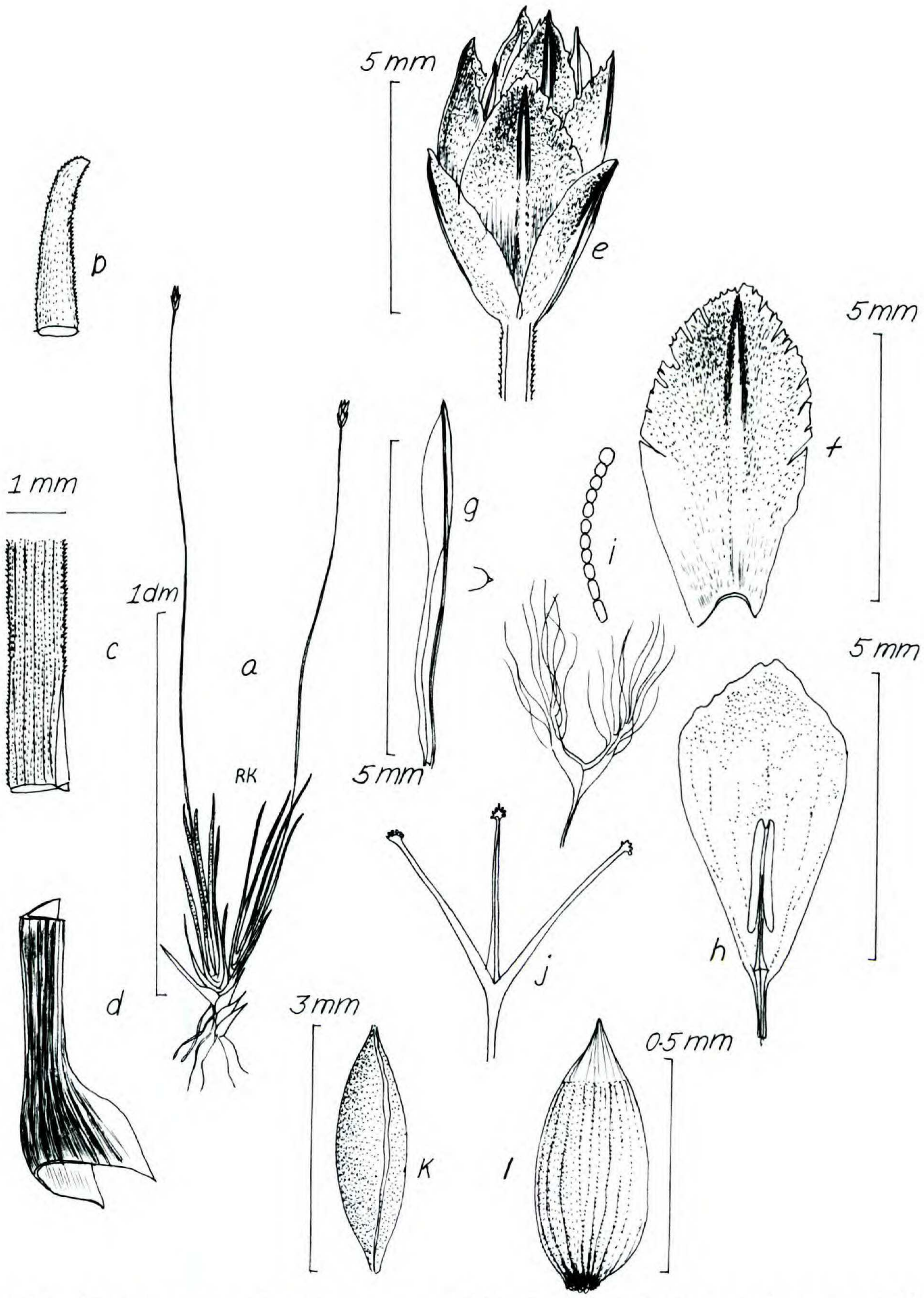


FIGURE 50. Xyris toronoana *(from the type).—a. Habit sketch.—b. Leaf tip.—c. Sector of midblade and sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract (somewhat flattened).—g. Lateral sepal.—h. Petal blade and stamen.—i. Staminodium and enlarged beard hair.—j. Stylar apex.—k. Capsule.—l. Seed.*

apices narrowed, narrowly rounded, thickened, often channelled; margins entire, not thickened; sheaths carinate, pale shining brown, several-nerved, scarious except for the ribs, the margins entire, gradually converging to blades, there producing a short, broad, scarious ligule. Scape sheaths lax, twisted, multicostate, opening toward apex, carinate, short-bladed. Scapes slender, terete, straight or somewhat flexuous, 2.5–3.5 dm high, 0.5–

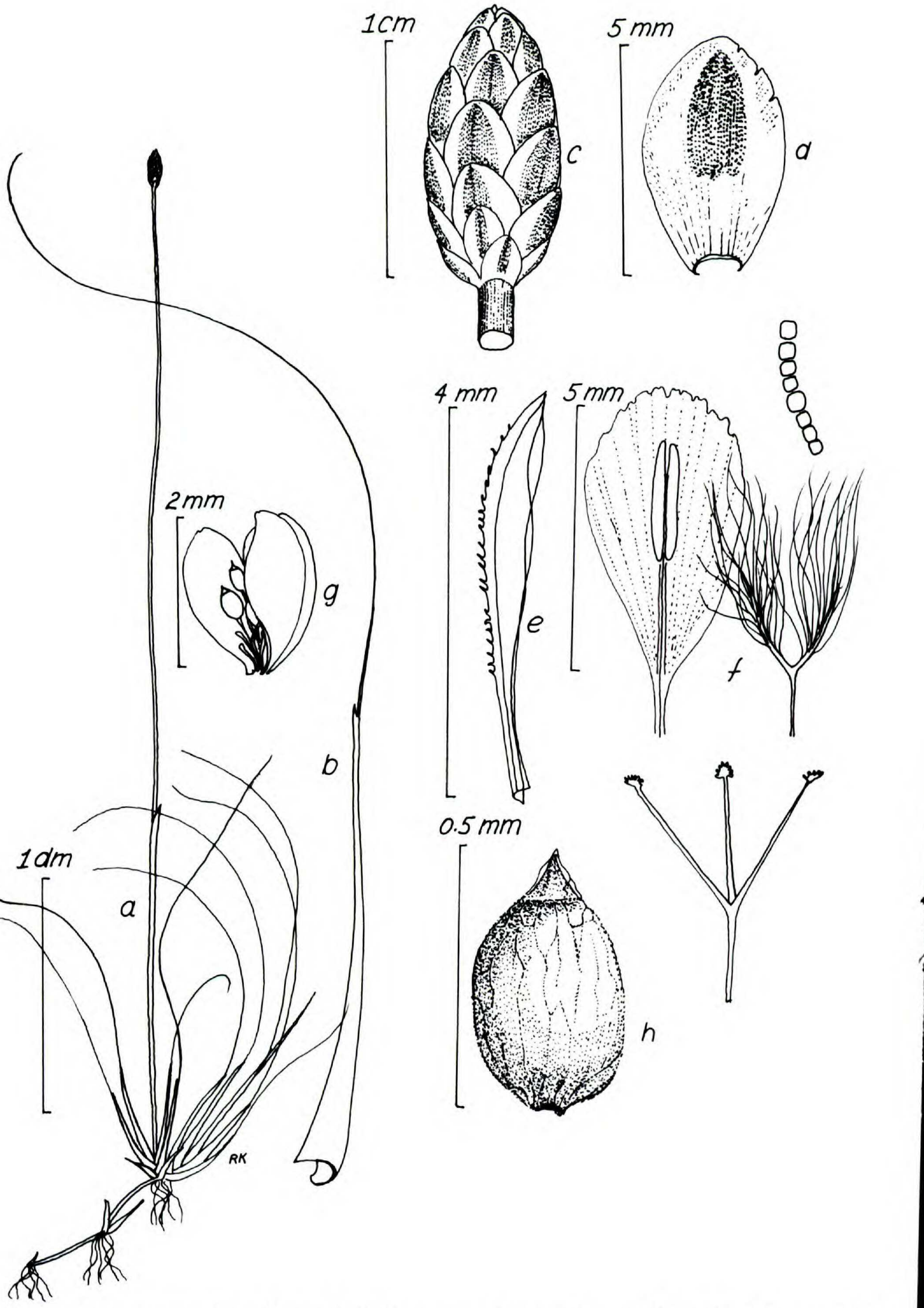


FIGURE 51. Xyris aquatica *(from* Fernandez 2887 *except where noted).—a. Habit sketch (composite from* Schultes & Cabrera 17565, Fernandez 2887*).—b. Leaf.—c. Spike.—d. Fertile bract.—e. Lateral sepal.—f. Petal, stamen, staminode, style branches.—g. Capsule.—h. Seed.*

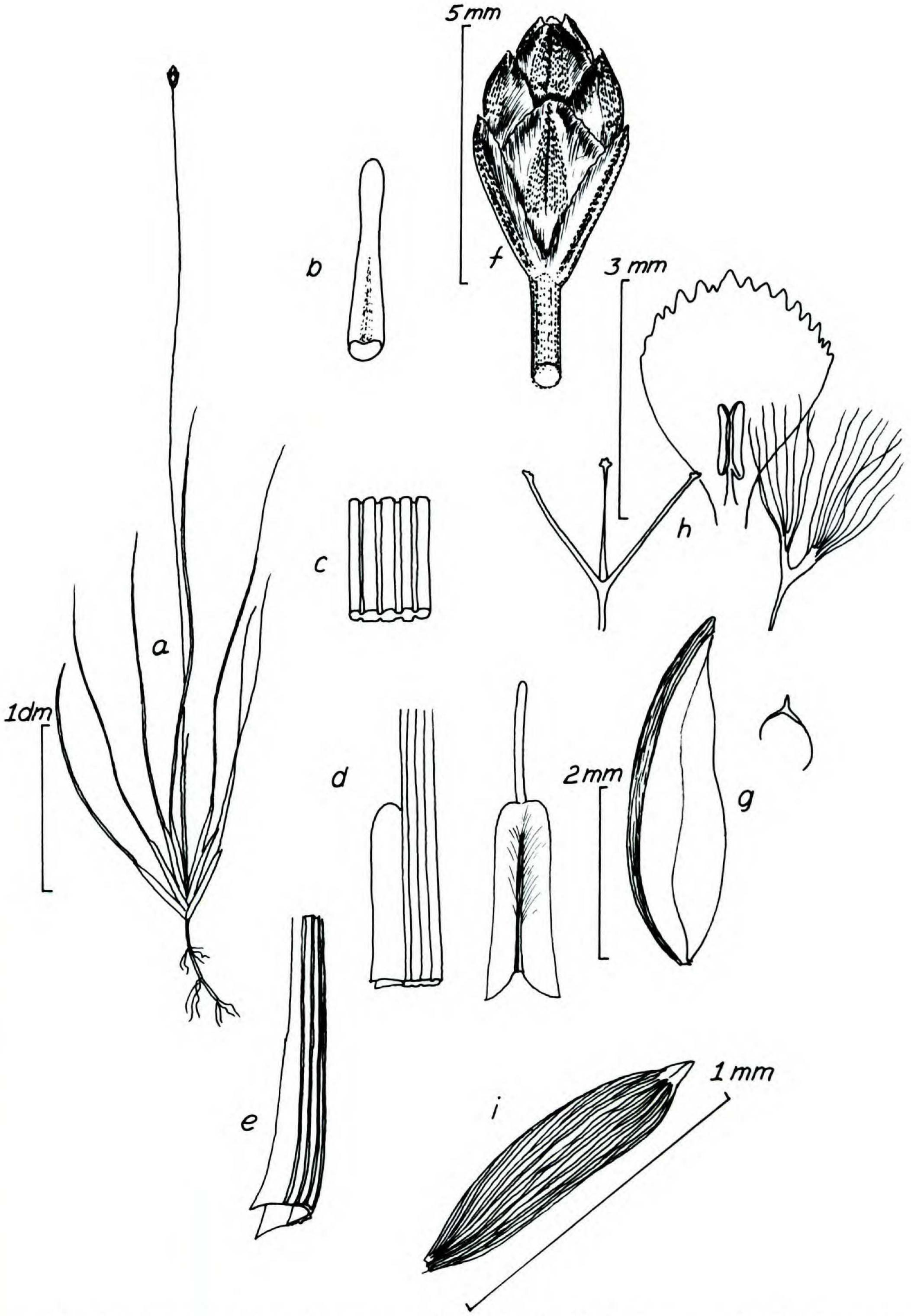


FIGURE 52. Xyris apureana *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade sector, mid-blade.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen, staminode, stylar apex.—i. Seed.*

0.6 mm thick, olive to reddish. Spikes several-flowered, elliptic, 5–6 mm long, acute, the bracts subdecussate, navicular or convex, ecarinate but medially 1-nerved, scarious, ferrugineous, erose; sterile bracts 4, the lowest pair at least ½ as long as the spike, oblong, the inner pair ovate, ca. 3 mm long; fertile bracts ovate, to 4 mm long, with reddish-scarious, entire to somewhat lacerate borders; dorsal area lanceolate, reddish brown or brown, ½ as long as or equal to the bract. Lateral sepals lanceolate, strongly inequilateral, ca. 4 mm long, acute; carinal keel narrow but strong, entire. Petal blades broadly obovate, 2.5–3 mm long, yellow, broadly rounded, strongly erose, cuneate. Staminodia bibrachiate, the branches long-penicillate. Anthers oblong, ca. 1.5 mm long, retuse and sagittate, slightly longer than the slender filaments. Capsule oblong, planoconvex, 2.5 mm long, amber, longitudinally finely multiribbed.

Distribution. Known thus far only from the type locality in Apure, Venezuela.

This subaquatic is superficially nearest *X. aquatica* on the one hand, and *X. spathacea* on the other. From both it differs in its more slender rhizomes, flattened leaves, and longer seeds.

53. Xyris stenostachya Steyerm., Fieldiana, Bot. 28(1): fig. 16K, L. 1951. TYPE: Venezuela. T. F. Amazonas: among rock outcrops, 100 m, Sanariapo, Río Orinoco, *J. Steyermark 58437* (holotype, F; isotypes, NY, US). Figure 53.

Solitary or cespitose, soft-based annual mostly 1–4 dm high, the stems contracted. Leaves spreading flabellately, 0.3–1.5 dm long; sheaths ½ as long as blades or shorter, tan or roseate, papillose or rugulose, narrowing evenly to blades, there producing a short, erect, scarious ligule, or ligule absent; blades linear-ensiform, flat, 1–3 mm wide, tapering above middle, then abruptly incurved-acute, the tip callused, the margins proximally tuberculate-scabrid or papillose, distally mostly smooth, the edges thickened-rounded, the surfaces maroon to yellow-green, papillose-rugose at least proximally and finely nerved. Scape sheaths as long as or shorter than leaves, tubular, twisted, costate, with short, erect blades similar to leaves. Scapes straight or flexuous, twisted, ca. 0.5 mm wide, subterete or angulate distally, striate and/or with 1–few costae and strongly scaberulous-rugose. Spikes lineal or lance-lineal, flattened, 1.5–5 cm long, the numerous distichous bracts navicular with strong dorsal areas medially unicostate and with narrowly rounded backs; sterile bracts ca. 4, the lowermost sometimes with long-excurrent, green dorsal areas, more often smaller than the fertile bracts and grading into them; fertile bracts lance-ovate to broadly oblong, 5–6 mm long, conduplicately rounded-folded around floret, apically broadly rounded, the margins scarious, a broad, pale entire to (in age) lacerate border around the large, lance-elliptic dorsal areas. Lateral sepals free, subequilateral, elliptic-linear or lance-linear, ca. 4 mm long, apically subulate or narrowly acute, tan, the narrow, firm, brown keel ciliolate to entire. Corollas gamopetalous, the limb ca. 5 mm long, the lobes lance-oblong, ca. 4.5 mm long, yellow, the apex acute, the margin remotely lacerate-dentate. Staminodes subsessile in sinuses of corolla, bibrachiate, the fleshy narrow branches with numerous penicillate, clavate hairs. Anthers lance-oblong, 0.5 mm long, on fleshy filaments ca. 1 mm long. Capsules narrowly ellipsoid, ca. 3 mm long; placentation basal. Seeds 3–6, some on funicles longer than themselves, fusiform, 1–1.5 mm long, amber, finely longitudinally striate, often with an irregular retinaculum of wider, reddish brown ridges.

Distribution. Wet sandy savanna, pools and seeps on and around granite outcrops, southeastern Colombia (not on basis of specimens but on basis of similar geology immediately across the Río Orinoco from an abundance of Venezuelan localities) eastward into the Orinoco of Territorio Federal Amazonas and Estado Bolívar, Venezuela.

Selected specimens examined. VENEZUELA. T. F. AMAZONAS: 12.5 km S of Puerto Ayacucho, 50 m, 2 Nov. 1971, *Davidse 2829A* (MO); la margen derecha del Río

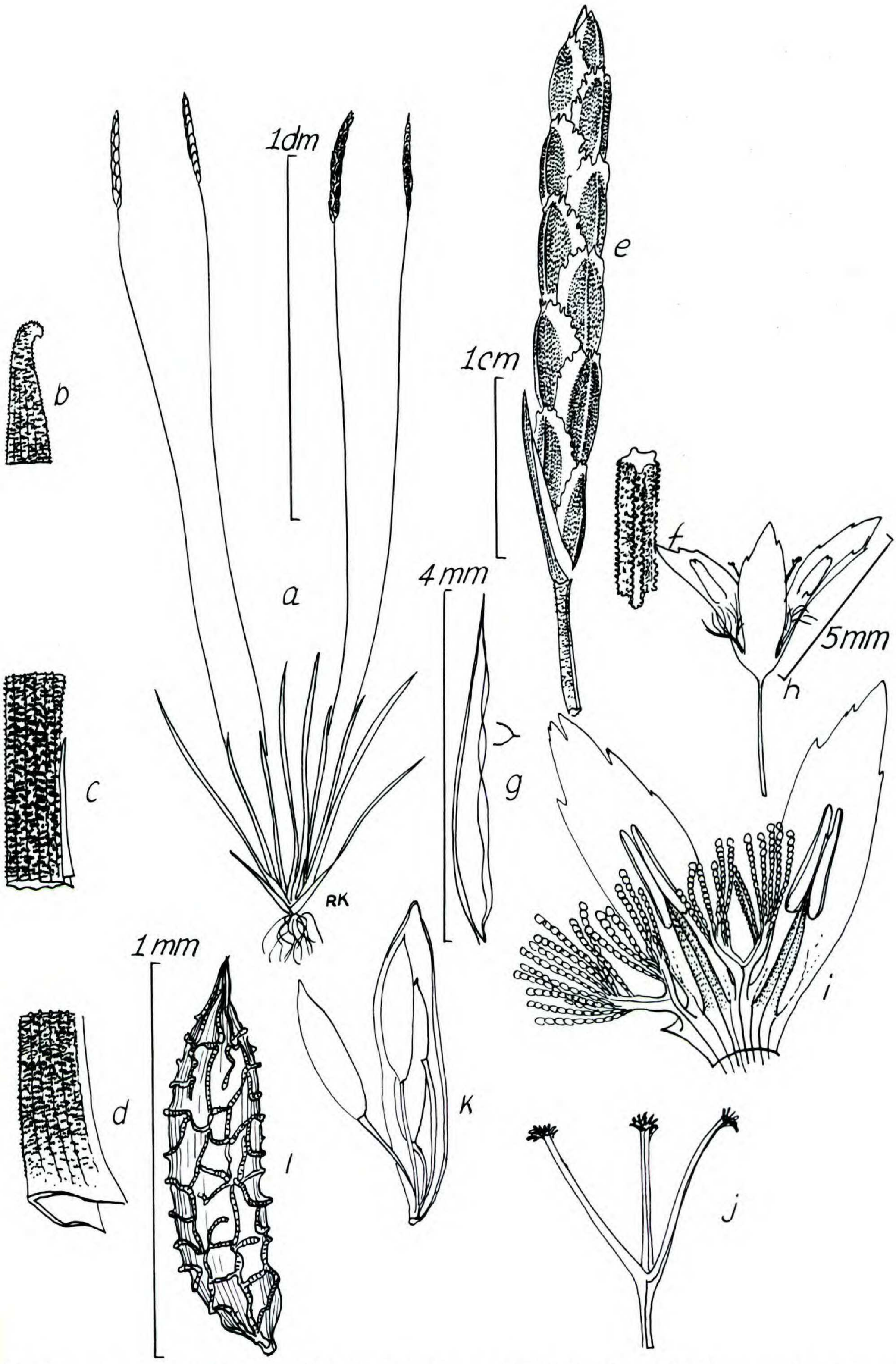


FIGURE 53. Xyris stenostachya *(*Kral 70681, 70727*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf at junction of blade and sheath.—d. Leaf base.—e. Spike.—f. Sector of upper scape.—g. Lateral sepal.—h. Oblique view of corolla limb.—i. Opened corolla showing stamens and staminodes.—j. Stylar apex.—k. Capsule, open to show one valve and placentation.—l. Seed.*

Guayapo, en el "Salto Moriche," 9 Oct. 1983, *Guánchez & Varadarajan 2573* (TFAV); 2 km al sur de Puerto Ayacucho, del Río Autana en raudal "seguera," 8 Nov. 1984, *Guánchez & Melgueiro 3324* (TFAV, VDB); aeropuerto de Puerto Ayacucho, 75 m, 13 Sep. 1977, *Huber 1046* (MYF, NY, VDB, VEN); Cerro Yapacana, ca. 100 m, 14–28 Feb. 1978, *Huber 1546* (US); 20 km SE de San Juan de Manapiare, 140 m, 17 Aug. 1978, *Huber 2340* (US); la región del Caño Corocoro, al N de bajo Río Ventuari, *Huber 2379* (US, VDB, VEN); 5 km al NE de Galipero, 3 Dec. 1979, *Huber 4759* (NY, US); savanna I, Yapacana savannas, 9 Aug. 1983, *Kral & Huber 70681* (BM, F, K, L, MO, NY, SP, TFAV, U, US, VDB, VEN); fisheries lab, granite outcrops, Puerto Ayacucho, 11 Aug. 1983, *Kral 70727* (BM, F, K, L, MO, NY, SP, TFAV, U, US, VDB, VEN, and others); Caño Sambolje near La Urbana, *Maguire 28989* (NY, US); Yapacana Savanna I, at 125 m, 7 Jan. 1951, *Maguire et al. 30787* (C, NY); 35 km SE of Puerto Ayacucho, *Steyermark et al. 122491* (MO, NY). BOLÍVAR: Cerro San Borja, occasional, Río Orinoco at 100–300 m, 12 Dec. 1955, *Wurdack & Monachino 39845*; Río Villacoa, 1–4 km above Salto de Humito, 7 Jan. 1956, *Wurdack & Monachino 41164* (F, NY, US).

This distinctive little annual is most abundant in the shallow pools or seeps in and around granitic lajas within the Venezuelan "piedmont" above the Great Bend of the Orinoco. No other species remotely resembles it. The pale yellow flowers open in the morning.

54. Xyris stenocephala Malme, Bih. Kongl. Svenska Vetensk.-Akad. Handl. 22, Afd. 3(2): 18, tab. 1, fig. 1. 1896; Smith & Downs, Fl. Bras. 9(II): 105–106, tab. 34, figs. 1020–1027. 1968. TYPE: Brazil. Mato Grosso: lugar aberto, pantanoso, cerca de Santa Ana da Chapada, 700–800 m, 28 Nov. 1894, *Malme 1426* (holotype, S; isotype, MO; phototype, F). Figure 54.

Perennial or annual, solitary or cespitose, glabrous plants (1–)2–5 dm high, the stem short. Leaves erect to spreading flabellately, 5–20 cm long; sheaths at least ½ as long as blades, entire, strongly nerved, carinate, pale brown to deep red-brown, sometimes papillose, often with a strong, deep brown, lustrous costa, tapering gradually from a slightly dilated base to the blade, there eligulate or with a short, scarious ligule; blades narrowly linear, flattened, twisted, 1–4 mm wide, strongly nerved, tapering gradually to an incurved-acute, cartilaginous-bordered tip, the margins thickened, lustrous, pale to deep brown, rarely scabrociliate, the sides pale green to reddish green or ferrugineous. Scape sheaths shorter than principal leaves, tubular, ferrugineous, multicostate below, apically with short, flat blades. Scapes flexuous and twisted, distally terete, 1–1.5 mm thick, rarely unicostate with scabrid costa, mostly just striate, olivaceous to green-brown. Spikes mostly ellipsoid, 1–2 cm long, acute, smooth, of several tightly spirally imbricate bracts; sterile bracts usually 4, the lowest pair oblong, carinate, slightly shorter than the fertile bracts, these broadly ovate or obovate to suborbicular, 4.5–5.5 mm long, strongly convex and ecarinate, broadly to narrowly rounded apically, the matrix pale to deep lustrous brown with a pale, thin, entire to erose border, the dorsal areas pale to deep green or brown, ovate, large but subapical, with a strong but fine midrib. Lateral sepals free, strongly inequilateral, strongly curved, acute, ca. 4 mm long, the keel firm and broad, ciliolate from near base to tip; petal blades ca. 4 mm long, obovate, broadly rounded, lacerate, yellow. Staminodia bibrachiate, the branches densely penicillate. Anthers oblong, ca. 1.5 mm long, on filaments 0.5–0.7 mm long. Capsule planoconvex, obovoid, 2–2.5 mm long, the placenta basal. Seeds few, fusiform-curvate, 1.2–1.7 mm long, dark red-brown, translucent, strongly beaked, longitudinally multicostate.

Distribution. Wet, rocky and/or sandy savanna, mostly in northern Brazil, in Amazonas, Pará, Mato Grosso, and with an outlier in São Paulo.

Selected specimens examined. BRAZIL. AMAZONAS. "Estrada do Estanho," road to Igarapé Preto, 60 km SE of Transamazon Hwy., in white-sand savanna, 2 July 1979, *Calderon et al. 2737* (INPA, US, VDB). PARÁ: Mun. Itaituba, estrada Santarem–Cuiaba, BR 163, km 794, Serra do Cachimbo, Base Aérea, campina, solo arenoso, 25 Apr. 1983, *Amaral et al. 934* (INPA, NY, VDB); Campo do Jamaracaru, perto do barracão, Região do Ariramba, *Black et al. 57-19638* (UB); Mun. Itaituba, arredores da Base Aérea do Cachimbo, ca. aõ destacemento km 6 da estrada que vai para o Aeroporto km 794, savana, 25 Apr. 1983, *Silva et al. 82* (INPA, NY, VDB). SÃO PAULO: Mun. Moji-Guacú, "Campos das Sete Lagoas," Fazenda Campininhá, just N of Rio Moji-Guacú, 4 km NNW of Padua Sales, 14 Dec. 1962, *Eiten 5104* (MO, US).

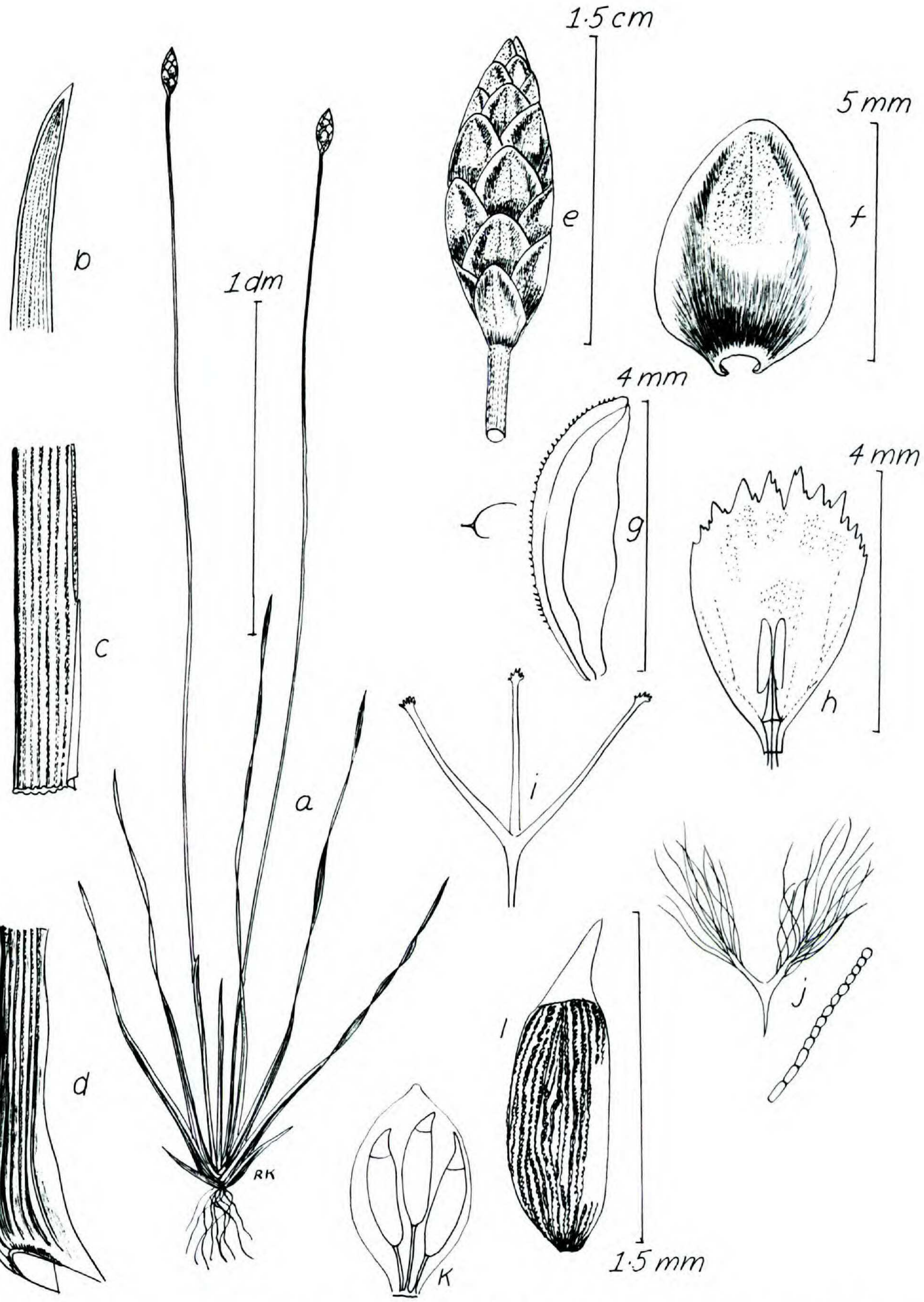


FIGURE 54. Xyris stenocephala (Silva et al. 82).—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Stylar apex.—j. Staminode.—k. Outline of capsule, showing placentation.—l. Seed.*

This taxon is most abundant in low-elevation, white-sand savanna, particularly in eastern Mato Grosso (Norte) and southwestern Pará but should be looked for in comparable areas north of the Amazon. It borders on larger forms of *X. paraensis*, particularly var. *longiceps*, but differs markedly in its glassy-bordered leaf blades and markedly

larger seeds. Populations appear to be sometimes annual, although they are usually perennial. Perhaps this is a matter of degree of disturbance of habitat, particularly the very seasonal nature of moisture in white-sand savanna. Or it could be that crowding produces a depauperate, annual habit.

55. Xyris cylindrostachya Kral & Wanderley, sp. nov. TYPE: Brazil. Amazonas: Mun. Presidente Figueiredo, "Campina das Pedras," ubicada en el km 115, de la Rodovia BR-174 (Manaus–Caracaraí), en el lado oriental del Igarapé das Lajes, 1°58′S, 60°02′W, ca. 100 m, 29–30 June 1985, *O. Huber & Luíz O. Adao Teixeira 10663* (holotype, INPA; isotypes, NY, VDB). Figure 55.

Herba perennis, glabra, densicaespitosa; radices graciles. Caules breves. Folia principalia anguste linearia, 10–30 cm longa, erecta vel flabellate expansa, vaginis scaporum longiora. Laminae foliorum compressae, leviter tortae, 0.8–1 mm latae, vaginis 2–4-plo longiores, longitudine indistincte nervosae, dilute virides; apices gradatim contracti, subulati, subteretes; margines leviter incrassati, integri, pallide brunneoli vel ad basin fuscobrunneoli, persaepe nitidi; vaginae carinatae, integrae, rufobrunneolae vel ferrugineae, papillosae, multicostatae, infime gradatim dilatatae, tum margines in laminas gradatim contractae, ad apicem anguste acutam ligulam scariosam usque ad 2 mm longam efferentes. Vaginae scaporum tortae, tubulosae, multicostatae, ferrugineae, ad apicem apertae, laminis brevibus. Scapi recti vel flexuosi, torti, 30–60 cm longi, ad apicem teretes, 1–2 mm crassi, persaepe rubelli, subtiliter striolati. Spicae ovoideae vel (vulgo) cylindricae, 1–3 cm longae, 5–7 mm crassae, obtusae, multibracteatae, brunneolae, bracteis arcte spiraliter imbricatis. Bracteae steriles 2–4, oblongae, ca. 3 mm longae, naviculares, carinatae, in fertiles leviter transientes; bracteae fertiles late ovatae vel suborbiculatae, 4–5 mm longae, integrae, ecarinatae, valde convexae, areis dorsalibus late ovatis, fuscoviridibus. Sepala lateralia libera, valde inaequilatera, curvata; ala carinali lata, a basi ad apicem ciliolata. Laminae petalorum obovatae, 4–4.5 mm longae, luteolae, latae rotundatae, laceratae. Staminodia bibrachiata, brachiis dense longipenicillatae. Antherae oblongae, sagittatae, 1.5 mm longae; fila ca. 1 mm longa. Capsula planoconvexa, obovoidea, ca. 2 mm longa; placenta basalis. Semina curvato-ellipsoidea, apiculata, 0.6–0.7 mm longa, pallide rufobrunneola, translucida, longitudine subtiliter multicostata.

Smooth, densely cespitose perennial with slender roots. Stems short. Principal leaves narrowly linear, 10–30 cm long, erect to spreading flabellately, longer than the scape sheaths. Blades of leaves flattened, slightly twisted, 0.8–1 mm wide, 2–4 times as long as the sheaths, indistinctly nerved, pale green; tips gradually narrowed, subulate, subterete; margins slightly thickened, entire, pale brown to red-brown at base, often shining; sheaths carinate, entire, red-brown to ferrugineous, papillose, multicostate, gradually dilating below, then gradually narrowed into the blades, at apex producing a narrow, acute, scarious ligule to 2 mm long. Sheaths of scapes twisted, tubular, multicostate, ferrugineous, open at apex, with short blades. Scapes straight to flexuous, twisted, 30–60 cm long, terete toward apex, 1–2 mm thick, usually reddish, finely striate. Spikes ovoid to (commonly) cylindric, 1–3 cm long, 5–7 mm thick, obtuse, multibracteate, brownish, the bracts tightly spirally imbricate. Sterile bracts 2–4, oblong, ca. 3 mm long, navicular, carinate, but slightly grading into the fertile bracts; fertile bracts broadly ovate to suborbicular, 4–5 mm long, entire, ecarinate, strongly convex, with broadly ovate, red-green dorsal areas. Lateral sepals free, strongly inequilateral, curvate; carinal keel broad, ciliolate from base to apex. Petal blades obovate, 4–4.5 mm long, yellow, broadly rounded, lacerate. Staminodes bibrachiate, the branches densely long-penicillate. Anthers oblong, sagittate, 1.5 mm long; filaments ca. 1 mm long. Capsule planoconvex, obovoid, ca. 2 mm long; placenta basal. Seeds curvate-ellipsoid, apiculate, 0.6–0.7 mm long, pale red-brown, translucent, longitudinally finely multicostate.

Paratypes. BRAZIL. AMAZONAS: Mun. Presidente Figueiredo: "Campina das Pedras," ubicada en el km 115 de la Rodovia BR-174 (Manaus–Caracaraí), en el lado oriental del Igarapé das Lajes, 01°58′S, 50°02′W, ca. 100 m, 29–30 June 1985, *O. Huber & Luíz O. Adao Teixeira 10652* (INPA, NY, VDB). PARÁ: Mun. Oriximiná, Campos do Ariramba, campinas inundaveis da margem do Rio Jaramacarú; afloramento arenitoco; 80 m, 8 June 1980, *G. Martinelli 6847* (INPA, NY, VDB).

This species most closely resembles *X. stenocephala* Malme, differing from it primarily in its longer, narrower leaf blades, these less strongly bordered and more inconspicuously nerved. The spikes are very different, being mostly narrowly cylindric and blunt (rather than ellipsoid and acute). The

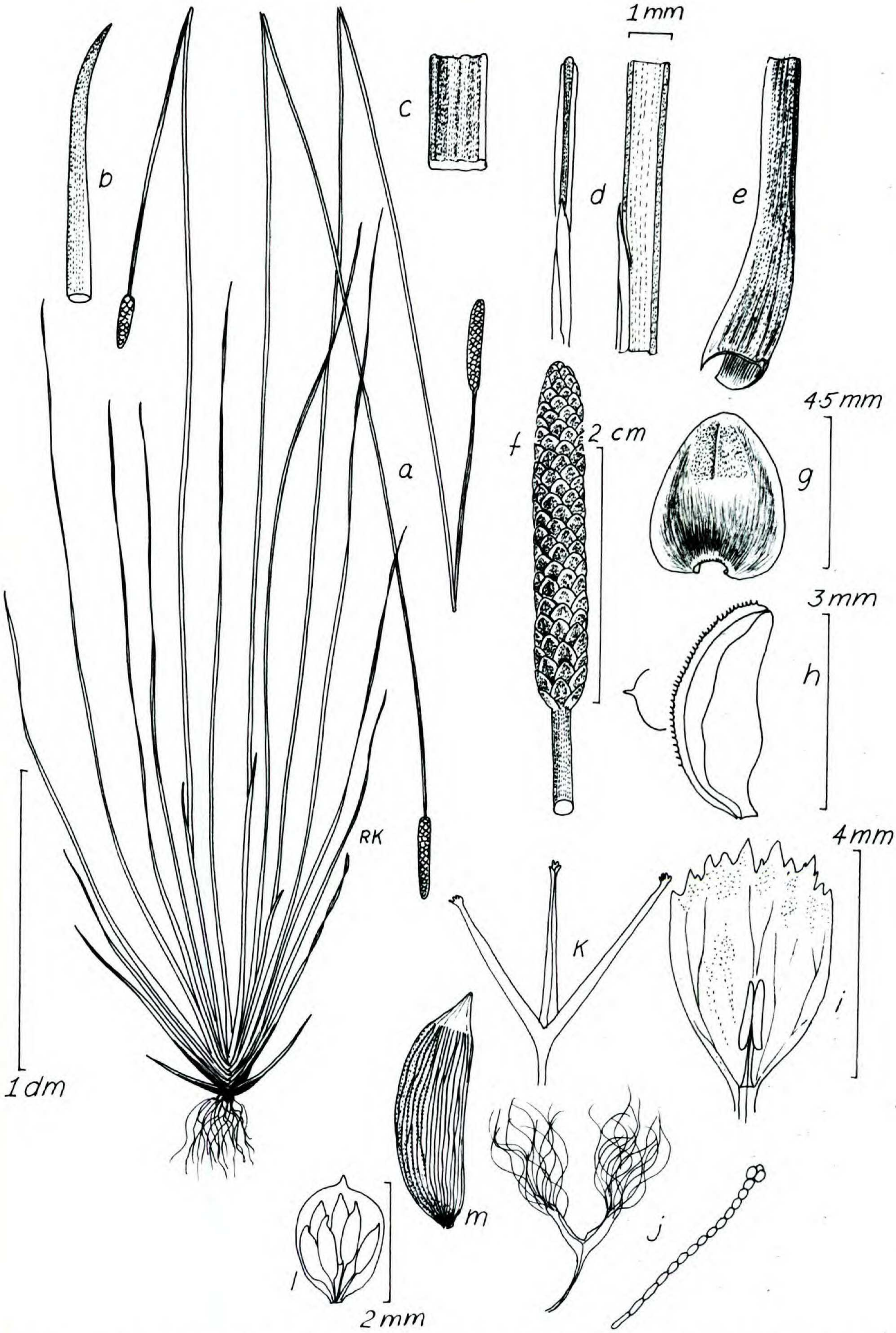


FIGURE 55. Xyris cylindrostachya *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf midblade sector.—d. Two views of leaf blade–sheath junction.—e. Leaf base.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade and stamen.—j. Staminode and enlarged beard hair.—k. Stylar apex.—l. Capsule outline, placentation.—m. Seed.*

lateral sepals are somewhat shorter and the seeds are significantly shorter (0.6–0.7 mm long vs. 1.2–1.7 mm long). These two species, along with the varieties of *X. paraensis*, *X. savannensis*, *X. uleana*, and *X. mima*, appear to provide an abundant (and perhaps sometimes intergrading) display on the white-sand campinas of the Amazonian savannas. Dense stands are often depauperate and mixed, escaping standard measures and aggravating the taxonomic problem.

56. Xyris brachysepala Kral, sp. nov. TYPE: Brazil. Pará: Serra dos Carajás, 2 km W of AMZA camp N-5, 6°04′S, 50°08′W, ca. 700 m, scrubby vegetation on ferric rock outcrops, moist low areas, 13 May 1982, *C. R. Sperling, R. S. Secco, M. Condon, A. L. Mesquita, B. G. S. Ribeiro & L. R. Marinho 5641* (holotype, INPA; isotypes, MG, NY, VDB). Figure 56.

Planta humilis, annua, glabra. Radices filiformes. Folia linearia, solum basalia, (2–)8–12 cm longa, erecta vel leviter expansa, vulgo vaginis scaporum longiora. Laminae folia principalium vaginis 3–4-plo longiores, spongiosae, tortae, a basin leviter compressae, alter teretes, ca. 0.5 mm crassae, viridulae, ad apicem abrupte contractae, obtusatae; vaginae subcarinatae, roseolae, integrae, in laminas gradatim convergentibus aut ad apicum ligulam scariosam curtam latam fascientibus, infime gradatim expansae. Vaginae scaporum laxae, plerumque apertae, rectae, carinatae, sine laminis aut laminis brevis. Scapi subteretes, subfiliformes, plus minusve spiraliter torti, ca. 0.5 mm crassi, striati. Spicae lanceoloideae vel anguste ellipsoideae, 1–2 cm longae, anguste acutae, pluriflorae, bracteis arcte spiraliter imbricatis, tenuibus, pallide rufobrunneolis, marginibus tenuissimis, latis, pallidis, integris; bracteae steriles 4, oblongae vel anguste ovatae, 2–4 mm longae, acutae vel obtusae, obscure carinatae, fertilibus leviter breviores; bracteae fertiles ovatae, 5–7 mm longae, ad apicem carinatae, acutae; area dorsalis anguste triangulati, subapicales, virides, tum brunneolae, 2–3 mm longae. Sepala lateralia libera, curvata, aequilatera, lanceolata, 2–2.3 mm longa, acuta; ala carinali angusta, integra. Laminae petalorum obovatae, ca. 2 mm longae, luteolae, ad apicem erosae. Antherae oblongae, profunde bifidae et sagittatae, ca. 0.5 mm longae; filamenta plana, ca. 0.5 mm longa. Staminodia parce penicillatis. Capsula leviter dorsali-ventraliter compressa, obovoidea, ca. 3 mm longa; placenta basalis. Semina numerosa, ellipsoidea, 0.6–0.8 mm longa, pallide rufobrunneola, longitudine subtiliter multistriata, translucida.

The plant low, annual, smooth. Roots filiform. Leaves linear, strictly basal, (2–)8–12 cm long, erect to slightly spreading, mostly longer than the scape sheaths. Blades of the principal leaves 3–4 times longer than the sheaths, spongy, twisted, slightly compressed at base, otherwise subterete, ca. 0.5 mm thick, greenish, abruptly narrowed at apex, obtuse; sheaths subcarinate, roseate, entire, narrowing gradually to blades or producing a broad short scarious ligule at apex, gradually dilating below. Scape sheaths lax, commonly open, straight, carinate, without blades or with short blades. Scapes subterete, subfiliform, ± spirally twisted, ca. 0.5 mm thick, striate. Spikes lanceoloid to narrowly ellipsoid, 1–2 cm long, narrowly acute, several-flowered, with bracts tightly spirally imbricate, thin, pale red-brown, the margins very thin, broad, pale; sterile bracts 4, oblong to narrowly ovate, 2–4 mm long, acute to obtuse, obscurely carinate, slightly shorter than the fertile bracts; fertile bracts ovate, 5–7 mm long, carinate at apex, acute; dorsal areas narrowly triangular, subapical, green then (later) brown, 2–3 mm long. Lateral sepals free, curvate, subequilateral, lanceolate, 2–2.3 mm long, acute; keel narrow, entire. Petal blades obovate, ca. 2 mm long, yellow, erose at apex. Anthers oblong, deeply bifid and sagittate, ca. 0.5 mm long; filaments plane, ca. 0.5 mm long. Staminodia sparsely penicillate. Capsule slightly compressed dorsiventrally, obovoid, ca. 3 mm long; placentation basal. Seeds numerous, ellipsoid, 0.6–0.8 mm long, pale red-brown, longitudinally finely lined, translucent.

Distribution. Known only from grassy, rocky, acid savannas in Pará, Brazil.

Additional specimens examined. BRAZIL. PARÁ: Marabá, N_5, arredores do lago, canga, 14 May 1982, *R. S. Secco, C. Sperling, M. Condon, A. Mesquita, B. Gilberto R. & L. Marinho 155* (MG, NY, VDB); Marabá, Serra dos Carajás, N-4, proximo a transição para a mata, campo rupestre, solo de canga e na mata de terra firme, 20 Mar. 1984, *A. S. L. da Silva, N. A. Rosa, R. P. Bahia & M. R. Santos 1920* (MG, NY, VDB); Marabá, arredores estrada p/N_1 transição campo natural/veg. canga, 17 May 1982, *R. S. Secco, C. Sperling, M. Condon, A. Mesquita, B. Gilberto R. & Lucival Marinho 226.*

This little annual bears a strong resemblance to longer-spiked forms of *X. paraensis* Poeppig ex Kunth, but its leaves differ by

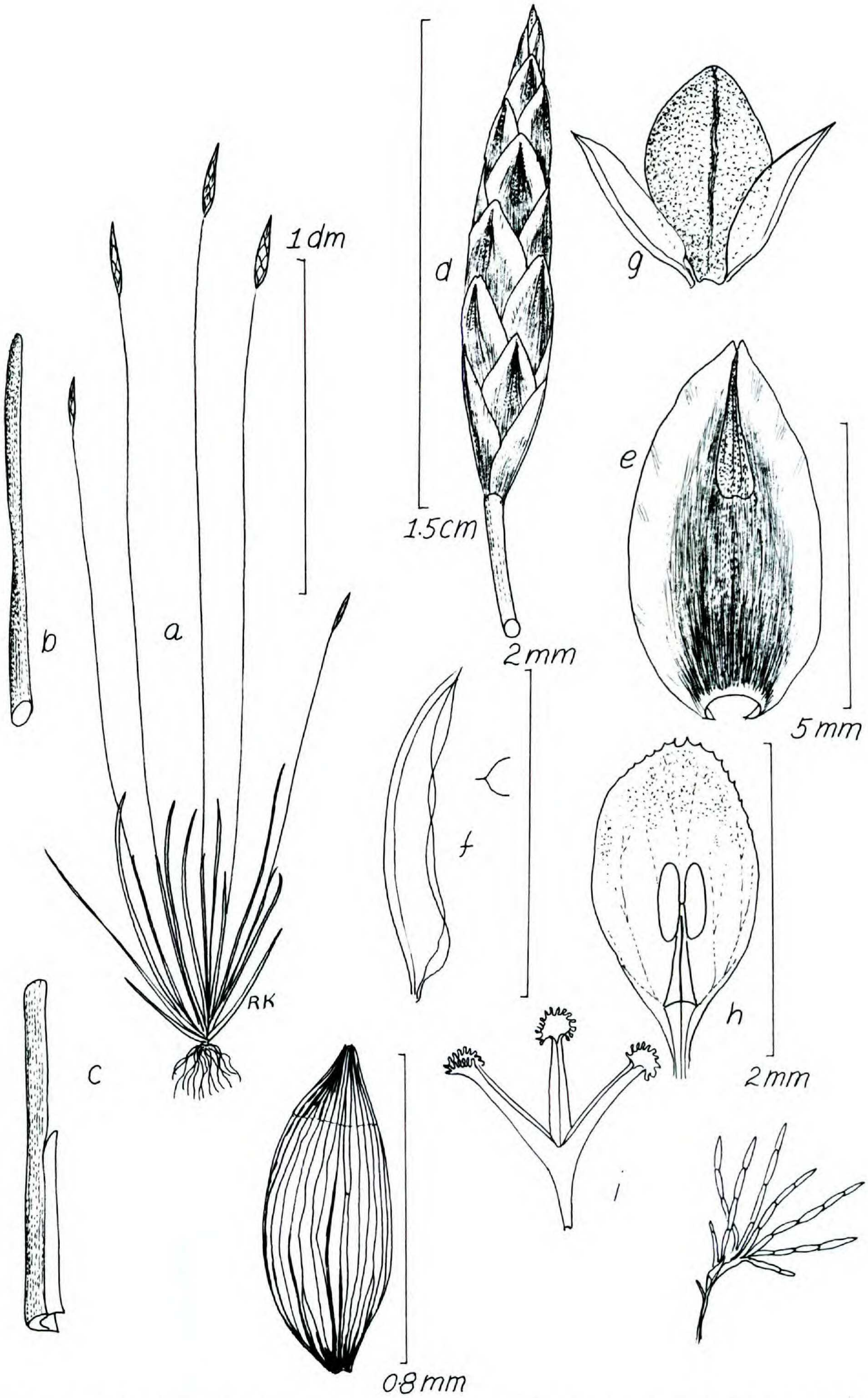


FIGURE 56. Xyris brachysepala (Sperling et al. 5641).—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Spike.—e. Fertile bract.—f. Lateral sepal.—g. Capsule, showing length relative to lateral sepals.—h. Petal blade, stamen.—i. Stylar apex.—j. Staminode.—k. Seed.*

being distinctly terete apically; the fertile bracts are larger but distinctly thinner with distinctive broad, pale thin borders and with narrower dorsal areas, these forming a carina subapically on the bract. The lateral sepals are much more reduced than is typical in most *Xyris*.

57. Xyris paraensis Poeppig ex Kunth, Enum. Pl. 4: 9. 1843. TYPE: Brazil. Pará: "Rio Para, *Poeppig, 1832*" (lectotype, B; phototype, US).

Three varieties are delimited by Smith & Downs (Arq. Bot. Estado São Paulo, nov. ser. 4(2): 28. 1966) for this complex whose greatest diversity appears to be in Pará, Brazil. The varieties *paraensis* and *longiceps* are thus far the only two collected within the area of my concentration, so, while the key below is to three, I am putting down full descriptions only of those two.

KEY TO VARIETIES OF *XYRIS PARAENSIS*

1a. Lateral sepals as viewed from the side broadly oblong and blunt; spikes predominantly ovoid to nearly round, mostly 5 mm long or less ..... 57A. *X. paraensis* var. *paraensis*

1b. Lateral sepals as viewed from the side lanceolate and acute; spikes ellipsoid to cylindric, at maturity predominantly 1–2 cm long.

2a. Spikes less than 5 mm thick, mostly cylindric, the bracts spiraled in 3–4 ranks ..... 57B. *X. paraensis* var. *longiceps*

2b. Spikes 5 mm thick, mostly ellipsoid, the bracts spiraled in 5–6 ranks ..... 57C. *X. paraensis* var. *polystachya*

57A. Xyris paraensis var. **paraensis.** Figure 57A.

Cespitose or solitary, mostly low and slender, mostly annual plants 0.5–4 dm high, the roots fine, the stems short. Leaves erect to spreading flabellately, the principal leaves 2–15(–20) cm long, the sheaths eciliate, stramineous to brown or red-brown, narrowing gradually from base to blade, with or without a narrowly triangular ligule to 1 mm long; blades flattened, slightly if at all twisted, 1–2.5 mm wide, narrowly linear, tapering gradually to an acute, usually calloused apex, the margins thin, unbordered, usually smooth, the surface green to maroon, very finely nerved and smooth. Scape sheaths shorter than principal leaves, the base tubular, multicostate, keeled, distally open and with a prominent leaflike blade, or the blade short, erect, fleshy. Scapes straight or slightly flexuous, twisted, distally terete, 0.3–0.8 mm thick, mostly ecostate but finely striate, smooth. Spikes ovoid to subglobose, 0.3–0.5 mm long, mostly acute, the several to many bracts in a spiral, tightly imbricate, with strong, unicostate dorsal areas, the few sterile bracts grading slightly larger into the fertile bracts, these obovate, low-auriculate, ca. 2–4 mm long, the apex broadly to narrowly rounded, entire or erose, the backs rounded, convex, ecarinate. Lateral sepals free, inequilateral, 3–4 mm long, strongly curvate, broadly acute to obtuse, the wide keel coarsely and irregularly ciliate to ciliolate. Petal blades broadly to narrowly obovate, 2–4 mm long, yellow, the broadly rounded apex lacerate. Staminodia bibrachiate, the flat, narrow branches sparsely penicillate terminally. Anthers broadly oblong, 0.5–0.7 mm long, the parallel sacs separated by wide connective, the filaments 0.5–0.7 mm long. Capsules broadly obovoid, somewhat compressed dorsiventrally, ca. (1–)2 mm long, the placentation basal, the valves without septa. Seeds ellipsoid or fusiform on long funicles 0.5–0.9 mm long, apiculate, amber, longitudinally distinctly but finely ribbed.

Distribution. Sandy savannas of mostly white sand, locally abundant, rare in Belize; rare in southern Venezuela; frequent to common eastward across Guyana to French Guiana and contiguous northern Brazil.

Additional specimens examined. BELIZE: pure sand savanna, Hattieville, 7 May 1972, *Dwyer & Pippin 10981* (MO); wet sand, Manatee Lagoon, 5 Jan. 1906, *Peck 269* (GH); All Pines, *Schipp S-131* (BM, F, GH, MO, NY). BRAZIL. PARÁ: Mun. Itaituba, estrada Santarem–Cuiaba, BR 163, km 794, Serra do Cachimbo, *Amaral et al. 930* (INPA, NY, VDB); Campina do Itajura, Ilha de Colare, 28 Sep. 1954, *Black 54-1687a* (US, VDB); campina do Palha, Vigia, 10 Aug. 1954, *Black 54-16742* (US, VDB); Ilha de Colares, sítio Horizonte, Mun. Vigia, 29 Sep. 1954, *Black 54-16911* (US, VDB); vic. Cachoeira, BR 22, km 98, roadside, 24 Aug. 1964, *Prance & Silva 58840* (NY, VDB). TERR. RORAIMA: Serra da Lua foothills, 2°25–29′N, 69°11–14′W, 12 Jan. 1969,

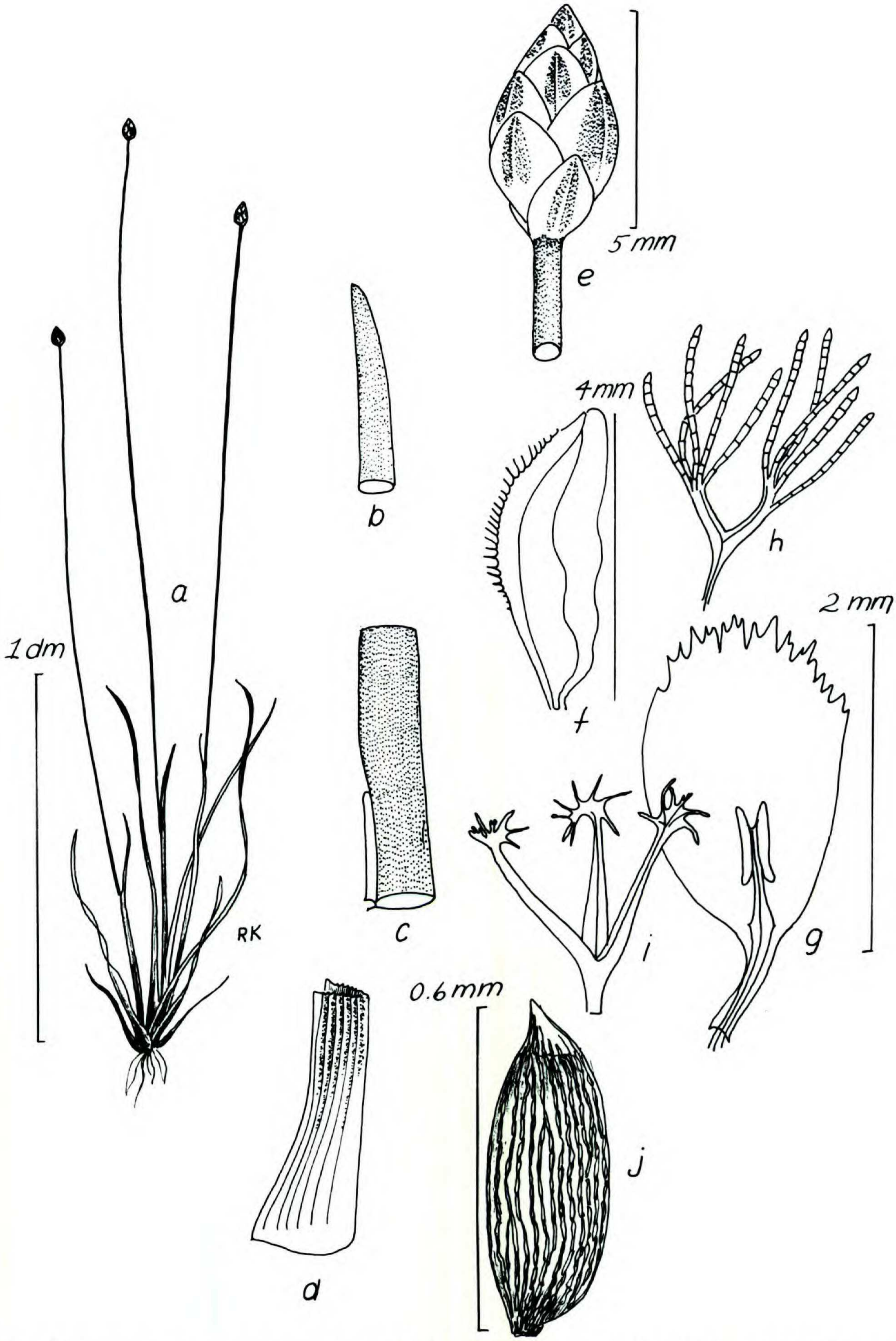


FIGURE 57A. Xyris paraensis *var.* paraensis *(*Black 54-16742*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Seed.*

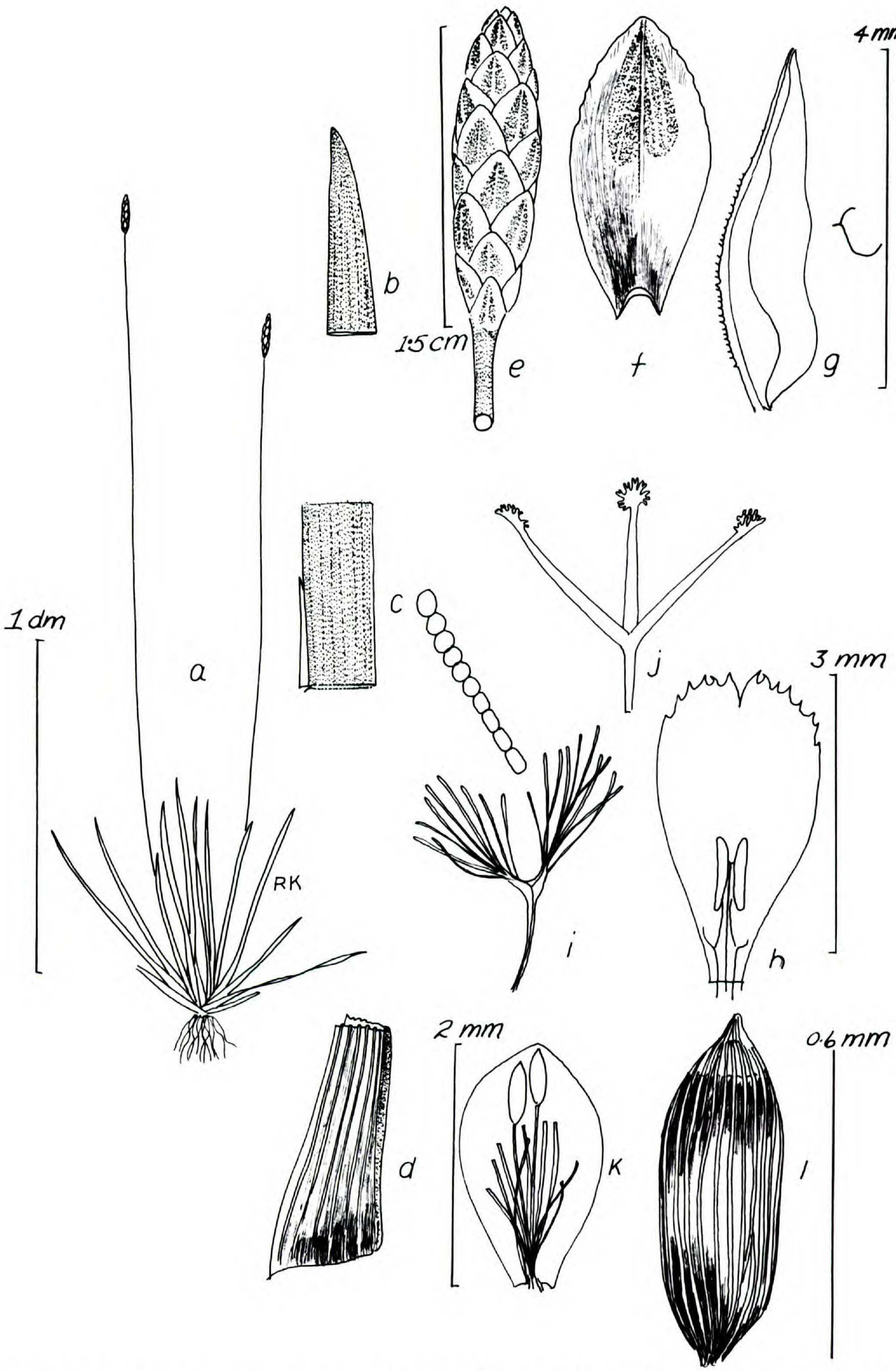


FIGURE 57B. Xyris paraensis *var.* longiceps *(*Huber 2581*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged sector of beard hair.—j. Stylar apex.—k. Diagram of capsule and placenta.—l. Seed.*

Prance et al. 9208 (U). FRENCH GUIANA: Savanes de Kourrou, transect no 12, *Institut Francais D'Amerique Tropicale* (U). GUYANA: "English Guiana, *Schomburgk 98*" (two specimens, the left-hand one *X. savanensis* Miq.). SURINAM: Lonbin savanna inter Zanderij I and Hannover, opn. 131, *van Donselaar 353* (U); Brokopondo 4 km E of village Brownsweg, 22 Dec. 1965, *van Donselaar 2841a* (U); Zanderij, sand savanna, *Florschutz 802* (U); Prope Jodensavanne (fluv. Suriname) tr. 10, p. 70, 8 Aug. 1956, *Heyligers 382* (U); Wilhelmina Gebergte, Zuid River, savanna S of Kayser Airstrip, 270 m, 26 Aug. 1963, *Irwin et al. 55233* (GH, K, NY, U, VDB); via secta ab Moengo tapoe ad Grote Zwiebelzwamp, big swaying swamp near km 18, 21 Oct. 1948, *Lanjouw & Lindeman 949* (U); Tibiti savanne, near km 3.2–4.0 second line, *Lanjouw & Lindeman 1789* (U); savanna 2 km N of river, 2 km W of Oost Rivier, 225 m, 11 July 1963, *Maguire et al. 54132* (NY, U, VDB); Center Sipaliwini savanna, ca. 2 km S of '4 Gebroeders Creek, *Oldenberger et al. 5954* (U); Forest of Zandery, 31 May 1916, *Samuels 433* (GH); Savanne ca. 2 km va. Bo. Lucie R., 9 Aug. 1963, *Schulz LBB 10358* (U); Nat. Res. "Brinckheuvel" (Saban-Pasi Savanne), *Teunissen & Wildschut 11522* (U). VENEZUELA. GUARICO: Morichal Hato Becevia 25 km sur de Calabozo, Nov. 1966, *L. Aristeguieta 6469* (VEN).

This variety is the most often misidentified as *X. savanensis*, which may produce smooth-leaved forms (var. *glabrata*). Careful examination should solve the problem in that *X. savanensis* produces no staminodial beard. If flowers are lacking, then seed characters help in that the shorter seed of *X. savanensis* has the typical truncate and apiculate apex. On the other hand, *X. mima* would pose a problem except for its uniquely comose seed tips.

57B. Xyris paraensis var. **longiceps** (Malme) Lyman B. Smith & Downs, Ark. Bot. Estad. São Paulo 4(2): 28. 1966. *Xyris longiceps* Malme, Rec. Trav. Bot. Neerl. 9: 131. 1912. TYPE: "in arenosis inundatis Para (Suriname), *Splitgerber 978*" (lectotype, U). Figure 57B.

Xyris leptostachya Malme, Rec. Trav. Bot. Neerl. 9: 132. 1912.

Leaf blades often longer and wider than in the typical variety, the leaf tips tending to be less thickened, sharper, the habit sometimes perennial or the plants harder-based, more strongly tufted. Spike outline narrower, mostly narrowly ellipsoid, or fusiform-cylindric, mostly 1–2 cm long, rarely wider than 0.4 cm. Lateral sepals predominantly lance-ovate, acute, the narrow keels rather uniformly ciliolate. Seeds mostly 0.5–0.6 mm long.

Distribution. Sandy savanna of mostly low-elevation, southeastern Colombia and eastward (occasionally) into Surinam (abundantly) and northern Brazil (Amapa, Pará).

Selected specimens examined. COLOMBIA. AMAZONAS: frequent in Araracuara savannas, Rio Caquetá, 400 m, 6 Sep. 1959, *Maguire et al. 44162* (NY). VAUPÉS: Río Vaupés, cachivera de Yuruparí, 400 m, 24–26 Oct. 1952, *García-Barriga 14936* (NY); Río Kudujarí: Cerro Yapoboda, ca. 450 m, 5–6 Oct. 1951, *Schultes & Cabrera 14379-a* (GH); Río Negro, San Felipe & vic., *Schultes & Cabrera 18116* (GH); Circasia: savanna, ca. 800 ft., Nov. 1951, *Schultes & Cabrera 19647*. SURINAM: Savanna Zanerij I, *Boldingh 3044* (U); zandsavanne bij Zanderij I, 11 Oct. 1958, *van Donselaar 377* (U); Zanderij I, 14 Sep. 1937, *Essed s.n.* (U); prope Jodensavanne (fluv. Suriname) in savannis arenosis, *Heyligers & Knoppe 325* (U); Mata, 15 km in dir. occid. a Zanderij, 27 Nov. 1960, *Kramer & Hekking 2239* (U); Zanderij I, open wet sand savanna, 4 Nov. 1948, *Lanjouw & Lindeman 162* (U, VEN); E of Kopie Peninica R. distr. Commewijne, 16 July 1953, *Lindeman 4407* (U); iter secundum surinamense, July–Sep. 1926, *Pulle 58a* (U). VENEZUELA. T. F. AMAZONAS: alrededores del Campamento Asisa, margenes del Río Asisa, trib. del Río Parú, 8 May 1973, *Hoyos & Morillo 126* (US, VEN); alrededores de Puerto Ayacucho, 26 Jan. 1978, *Huber & Cerda 1445* (US, VEN); Aeropuerto de Maroa, white sand, 25 Aug. 1978, *Huber 2581* (US, VEN); ca. 30 km al N Puerto Ayacucho, ca. 80 m, 7 Nov. 1979, *Huber 4696* (US); Alto Ventuari, Jan. 1959, *Infante 44016* (VEN); Río Ventuari, Río Parú, etc. Sarranía Parú Expedition, 200 m, 15 Feb. 1949, *Phelps & Hitchcock 461* (NY, US, VEN); Maroa, 23 July 1982, *Stergios & Aymard 4014* (PORT, VDB); Esmeralda Savanna and SE base Cerro Duida, 200 m, 22 Aug. 1944, *Steyermark 57827* (F); Maroa, 80 m, airstrip, 7 Oct. 1983, *Steyermark 129426* (VDB, VEN); Esmeralda, ca. 325 ft., 1 Nov. 1928, *Tate 301* (NY). APURE: betw. Río Cinaruco near mouth of Caño San Miguel and southern part of the Galera de Cinaruco, 29–30 Apr. 1977, *Davidse & Gonzalez 12348A* (US, VEN); E side of Galeras de Cinaruco, 6 km N of southernmost tip along Quebrada El Porvenir, ca. 53 airline km NE of Puerto Paez, 21 Feb. 1979, *Davidse & Gonzalez 15571* (MO). BOLÍVAR: sabanas e orillas del Río Hacha, ca. 300 m, subiendo el río desde el Salto Hacha, 200–500 m, 16–17 Feb. 1964, *Agostini 266a* (US); sandstone outcrops by Ven 10, ca. 800 m, N of Río Yuruani Ferry, Puente Kumerepa, 19 Dec. 1984, *Kral 72190* (MYF, VDB, VEN, and to be distributed); along Río Karuai, NW of Sta. Teresita de Kavanayen, 1,220 m, *Steyermark 60823A* (US).

The petiolelike constriction of old bracts in this and in var. *polystachya* is created by infolding of the auriclelike bract base. The closest affinity of this variety, other than to

var. *polystachya*, is to *Xyris cuatrecasana*, which may turn out to be merely a part of the latter.

58. Xyris mima Lyman B. Smith & Downs, Proc. Biol. Soc. Wash. 73: 250, fig. 4. 1960. TYPE: Brazil. Pará: campo arenoso artificial, Missão Nova, Rio Cururu, região do Alto Rio Tapajos, 12 July 1959, *Egler & Raimundo 791* (holotype, US). Figure 58A, B.

Xyris trisperma Kral & Lyman B. Smith, Phytologia 53: 433–434, fig. 1a–i. 1983. TYPE: Venezuela. Bolívar: cumbre de Cerro Guaiquinima, Salto del Río Szczerbanari (Río Carapo), 1–2 km río arriba del Salto Szczerbanari, 750 m, 20–25 Jan. 1977, *J. A. Steyermark et al. 113149* (holotype, VEN; isotypes, US, VDB).

Solitary or cespitose, slender, mostly low annual (0.5–)1–3 dm high, the stems contracted. Leaves erect or spreading flabellately, 0.5–2.5 dm long; sheaths entire, strongly keeled, less than ½ as long as blades, gradually narrowing from the dilated base to the blade, there producing a narrowly triangular erect ligule to 0.5 mm long or eligulate, the surfaces tuberculate-rugose (rarely smooth); blades narrowly linear to linear-gladiate, strongly flattened, sometimes slightly twisted, apically incurved-acute, the margins tuberculate-scabrid (rarely entire), the surfaces verrucose-scabrid (rarely smooth), strongly nerved, deep reddish green to maroon. Scape sheaths slightly to much shorter than principal leaves, reddish brown below, multicostate, tubular, twisted, opening distally, strongly keeled, producing a short blade. Scapes straight or slightly flexuous, twisted, papillate or rugoscabrid, dull green, subterete to slightly compressed distally, thus oval or elliptic in cross section, bicostate, the costae strong, usually strongly tuberculate-scabrid or papillate. Spikes ovoid to short-cylindric or narrowly ellipsoid, 3–15 mm long, mostly acute, of few–several tightly spirally imbricate bracts with narrow but distinct, usually greenish dorsal areas, the sterile bracts mostly 4–6, the lowest the smallest, slightly shorter than the fertile bracts, ovate, keeled or carinate, grading into the fertile bracts, these mostly broadly ovate to broadly obovate, 4–4.5 mm long, the apex broadly rounded, sometimes emarginate, the margins entire, the backs ecarinate, convex. Lateral sepals free, slightly inequilateral, oblong-curvate, ca. 3–3.5 mm long, the broad, thin keel ciliate mostly from just below middle to the blunt apex. Petal blades broadly obovate, ca. 4 mm long, yellow, the broadly rounded apex lacerodentate. Staminodia bibrachiate, the narrow, flat branches penicillate-ciliate distally with clavate hairs. Anthers broadly oblong, ca. 0.5 mm long, shallowly bifid, deeply sagittate, on filaments ca. 0.6–0.7 mm long. Capsules broadly obovoid, planoconvex, ca. 2.5 mm long, the placentation basal, the valves lacking septa. Seeds numerous, mostly ellipsoid to fusiform, ca. 1 mm long, pale amber, the tip with a cone of pale bristles, the body finely longitudinally lined.

Distribution. Low, mostly white-sand savanna, Amazonian Brazil and contiguous Venezuela (Bolívar), locally abundant. Known in 1960 but only from the type collection.

Selected specimens examined. BRAZIL. AMAZONAS: Transamazon Highway, 9 km W of Rio dos Pombos, ca. 1.5 km E of Igarapé dos Oombos and ca. 64 km E of the Aripuanã, 19 June 1979, *Cleofe Calderón et al. 2577* (INPA, US, VDB); base of Serra Araca, 0–3 km south of Central Massif, 3 km E of Rio Jauari, 7 Feb. 1984, *Prance et al. 28870* (INPA, NY, US). MATO GROSSO: R. Juruena, Cachoeira São Simaõ, 21 May 1977, *Rosa & Santos 1959* (INPA, US, VDB). PARÁ: Mun. Itaituba, arredores da Base Aerea do Cachimbo, proximo ao destacamento km 6 da estrada que vai para o aeroporto km 794, 25 Apr. 1983, *Silva et al. 82* (INPA, NY, VDB). VENEZUELA. BOLÍVAR: topotype of *X. trisperma* Kral & Smith, 20–25 Jan. 1977, *Steyermark et al. 113222, 113445* (VDB, VEN).

This species very much resembles *X. savanensis* and *X. paraensis* var. *paraensis*. From the former it differs in its strongly bicostate scape, staminodia with beards, and longer and scaly-comose seeds. From the latter it usually differs in being much more scabrid of foliage and in its bicostate scape and longer, comose-tipped seeds.

In the Venezuelan locality the Steyermark discovery, found in a mixed population with *X. savanensis*, seemed to depart enough from

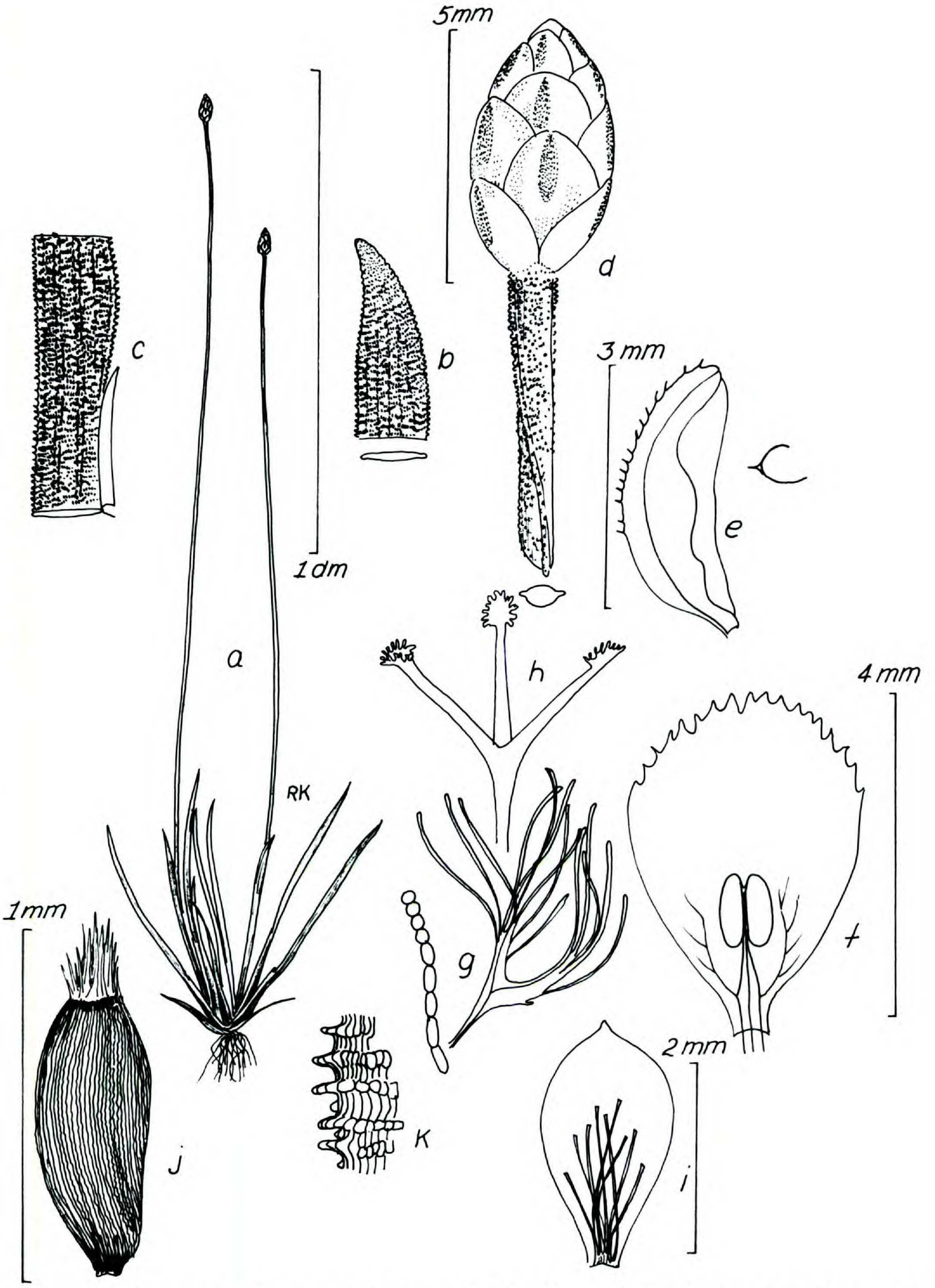


FIGURE 58A. Xyris mima (Steyermark & Dunsterville 113445).—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Spike, upper scape.—e. Lateral sepal.—f. Petal blade, stamen.—g. Staminode.—h. Stylar apex.—i. Capsule, two valves removed.—j. Seed.—k. Much-enlarged sector of leaf blade edge.*

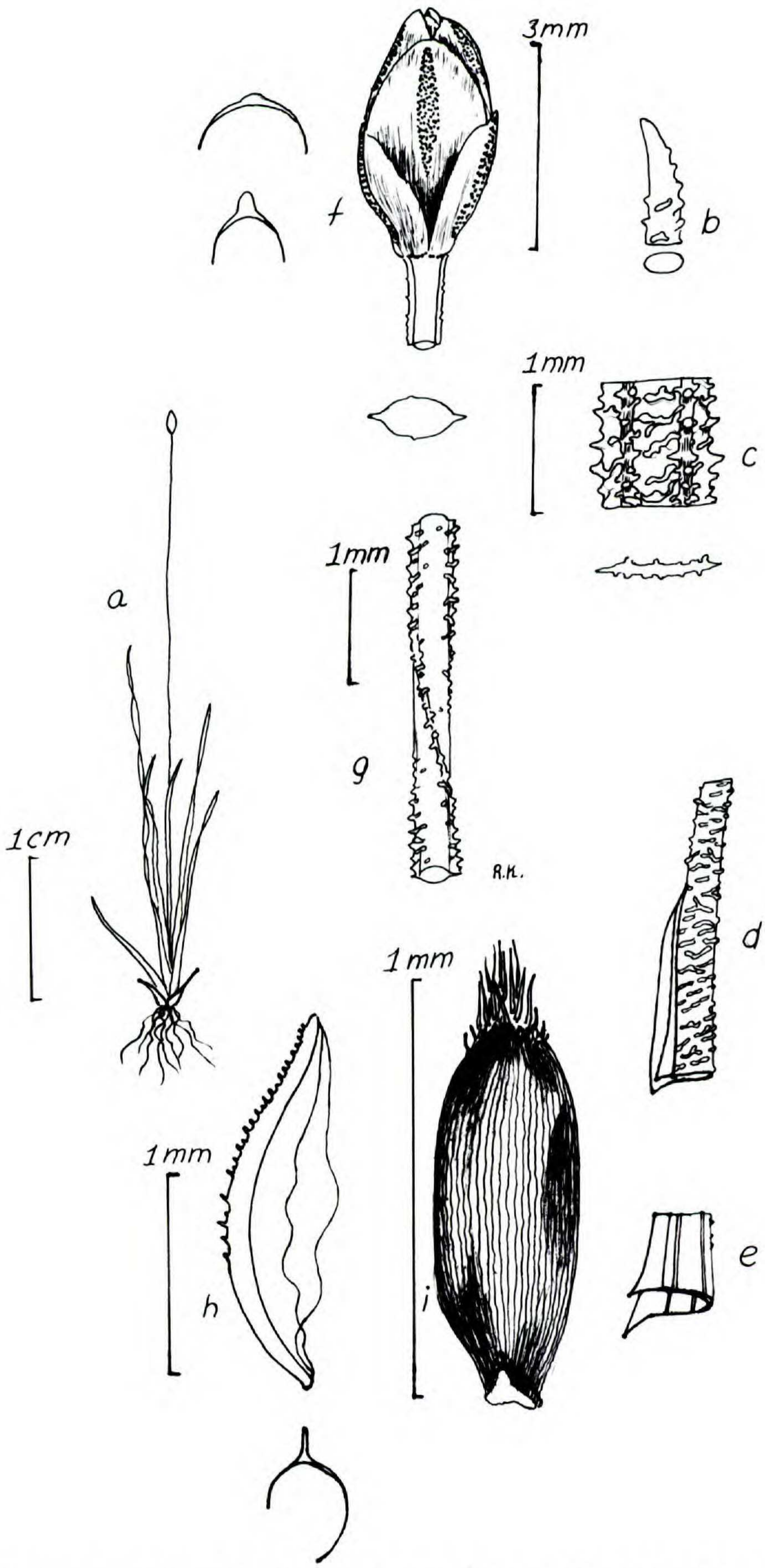


FIGURE 58B. Xyris mima *(from type of* X. trisperma*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade, sector at midblade.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike, upper scape.—g. Midscape sector.—h. Lateral sepal.—i. Seed.*

the original Smith and Downs description in regard to seed and sepal characters to warrant description. Cryptic species are not rare in *Xyris*, should be looked for, and at least for now deserve some place in the literature if only to acquaint readers with the "motion" in such a genus. However, it now appears, on consultation with a larger series of *X.*

mima, that *X. trisperma* fits within the former.

59. Xyris rubrolimbata Heimerl, Ann. k. k. Naturh. Hofmus. Wien 21: 70, pl. 4, figs. 4–6. 1906. TYPE: Colombia. Vaupés: moist sandy woods, Lomo, 100 km northwest of mouth of Casiquiare, Vaupés, Colombia, *Spruce 2994* (lectotype at W destroyed; isolectotype, K). Figure 59.

Low, cespitose, small but stiff annual mostly 0.5–1 dm high, the stems contracted, the roots capillary. Leaves spreading flabellately, 2–8 cm long, the sheaths from nearly as long as blades to longer, soft, strongly keeled, strongly nerved, entire, tapering gradually from the dilated base to the blades, there producing a narrowly triangular, erect, scarious ligule to 2 mm long; blades flattened, straight or rarely slightly twisted, linear-gladiate, narrowly acute, the margins cartilaginous-incrassate, usually forming a distinct, reddish brown band, the surfaces greenish gray or maroon, strongly and palely multinerved, smooth. Scape sheaths slightly shorter than principal leaves, tubular and twisted at base, striate, open toward apex, keeled, producing a short, flat, linear-triangular blade. Scapes straight or slightly flexuous, slightly twisted, terete distally, ca. 0.7 mm thick, greenish brown, striate, smooth. Spikes obovoid at maturity ca. 5 mm long, blunt, of several subdecussately arranged brown bracts with thin, usually fimbriolate margins and distinctly papillose dorsal areas; sterile bracts narrowly to broadly ovate, usually 4, the lowest pair ca. ½–⅔ as long as the spike, keeled, navicular; fertile bracts broadly obovoid, 3–3.5 mm long, the shallowly rounded or subtruncate apex aging erose, the backs slightly convex, the dorsal areas bisected by a single strong nerve. Lateral sepals strongly curvate, free, subequilateral, 2.5–3 mm long, blunt, yellow-brown, the firm, wide keel ciliolate-scabrid from ca. the middle to the apex. Petal blades obovate, ca. 3 mm long, the broadly rounded apex lacerate. Staminodia slightly bibrachiate, the broad, flat branches distally penicillate-ciliate. Capsule planoconvex, broadly obovoid, ca. 1.5 mm long, the placentation basal, the valves without septa. Seeds numerous, ellipsoid, 0.6–0.7 mm long, pale-apiculate, dark, translucent red-brown, longitudinally finely and spirally ribbed, the ribs finely beaded.

Distribution. Low Amazon caatinga, wet sand in southeastern Colombia and southwestern Venezuela, apparently rare.

Additional specimens examined. COLOMBIA. VAUPÉS: Río Guainía, Puerto Colombia (opposite Ven. Town of Maroa) and vic., ca. 800–850 ft., 31 Oct.–2 Nov. 1952, *Schultes et al. 18195* (GH). VENEZUELA. T. F. AMAZONAS: Río Negro at base of Cerro Cucuy, 2 Mar. 1944, *Baldwin 3212* (US); Maroa–Yavita rd., between Río Guianía and Caño Pimichin, at edge of bana (low Amazon caatinga) on wet white sand, 8 Oct. 1978, *Clark 6875* (NY); Maroa, 127 m, Guainía Alto Río Negro en malezas de terreno arenoso, 11 Feb. 1942, *Ll. Williams 14280* (F, US, VEN).

This little but uniformly distinctive annual xyris is so small as to be overlooked easily. It should be looked for in areas of Amazonian Brazil in places along the upper Rio Negro.

60. Xyris cuatrecasana Idrobo & Lyman B. Smith, Caldasia VI(29): 244–245, fig. 30a–d. 1954. TYPE: Colombia. Vaupés: Comisaria del Vaupés. Circasia; margenes del Vaupés, sobre granitos, 200 m, 9 Oct. 1939, *J. Cuatrecasas 7155* (holotype, COL; isotype, F). Figure 60.

Solitary or cespitose, soft-based annual to 3.5 dm high, the stem contracted. Leaves erect or slightly spreading flabellately, 8–12 cm long; sheaths ca. ½ or less as long as blades, entire, dull at base, pale red-brown or stramineous, tapering gradually to blade, there with a scarious, erect, narrow, acute ligule to 2 mm, the blades flat, ensiform-linear, 1.5–2.5 mm wide, tapering to narrowly acute apex, the margins subentire, the surfaces smooth and finely multinerved, green with strong maroon tints. Scape sheaths loose, shorter than leaves, carinate, short-bladed. Scapes lineal, straight or flexuous, slightly twisted, distally terete, ca. 1 mm thick, finely striate, ecostate, smooth. Spike ovoid-ellipsoid, ca. 1 cm long, acute, the numerous bracts tightly spirally

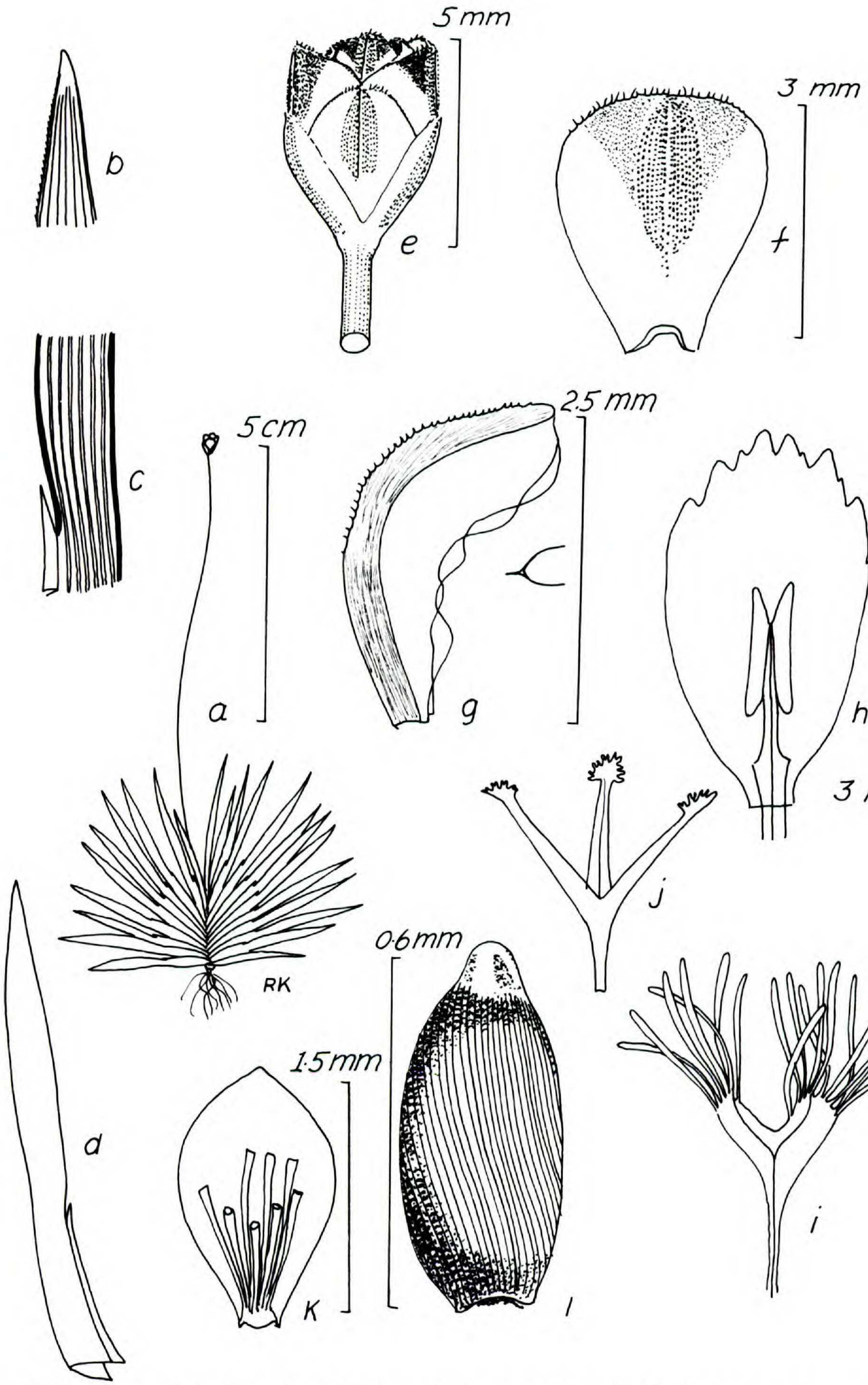


FIGURE 59. Xyris rubrolimbata *(J. T. Baldwin 3212).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf, outlined.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule, two valves removed to show placentation.—l. Seed.*

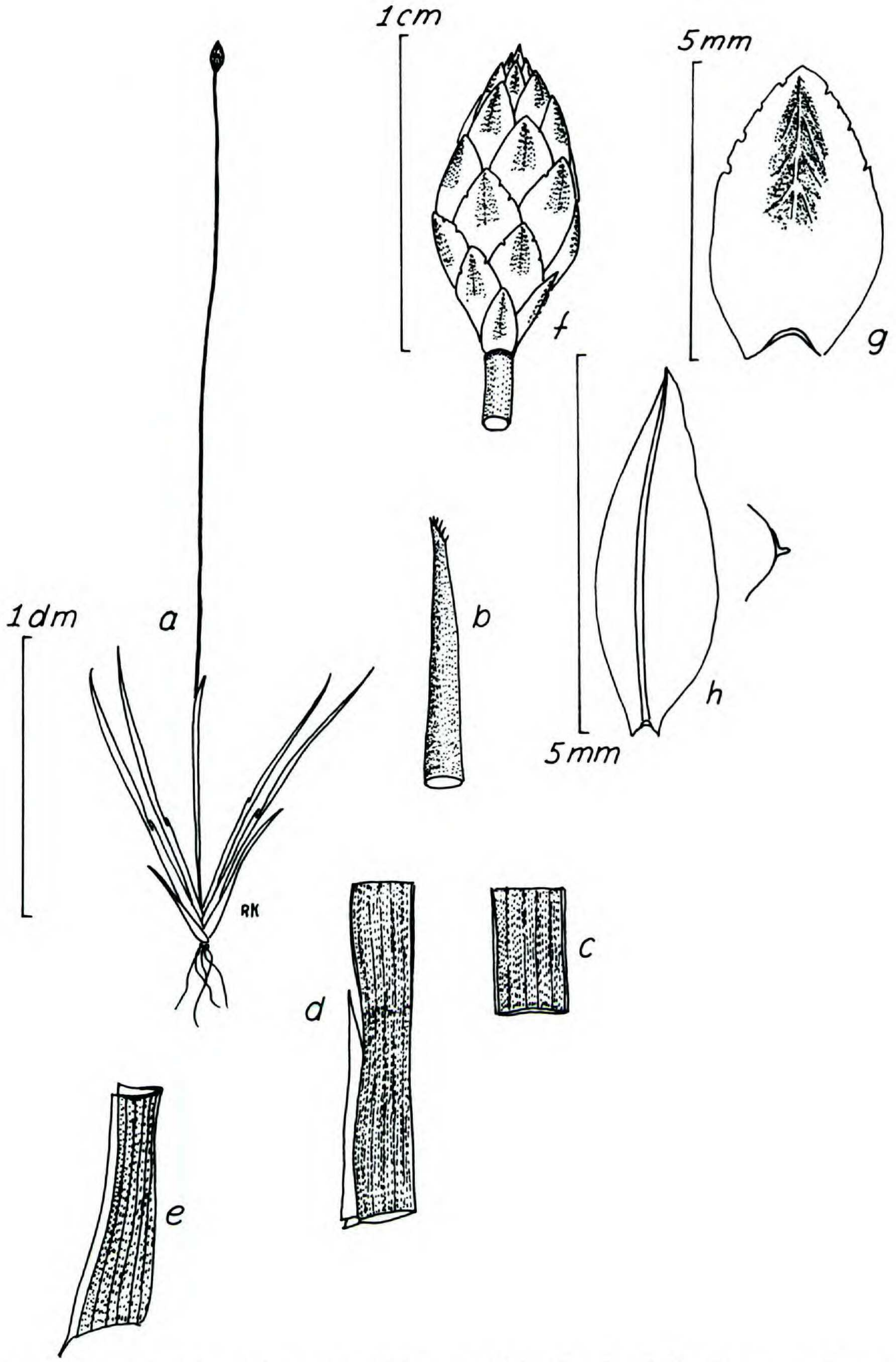


FIGURE 60. Xyris cuatrecasana *(from the isotype).—a. Habit sketch.—b. Leaf apex.—c. Sector of blade at midblade.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike and upper scape.—g. Fertile bract.—h. Lateral sepal.*

imbricate, thin, the sterile bracts several, smaller than the fertile bracts and grading into them, these ovate, ca. 5 mm long, acute, ecarinate, with strong, dark, lanceolate, venose dorsal areas and scarious, subentire to erose edges. Lateral sepals free, subequilateral, ca. as long as bracts, very thin, lanceolate, narrowly acute, the firm, narrow keel subentire. Corolla, staminodes, and stamens not seen. Immature capsule ellipsoid, ca. 4

mm long, the valves eseptate, the placentation basal. Immature seeds ellipsoid, ca. 1 mm long.

Distribution. Known only from the type.

This is perhaps not distinguishable from *Xyris paraensis* and except for the equilateral sepals could be considered a disjunct collection of var. *polystachya* of that species. However, until more information (seeds, flowers) becomes available, it seems best to retain the taxon.

61. Xyris pectinata Kral, Lyman B. Smith & Wanderley, sp. nov. TYPE: Brazil. Amazonas: Estrada Transamazônica–Capim, campina aberta, terreno arenoso, Proj. RADAM, 1 June 1976, *T. R. Bahia 35* (holotype, INPA; isotypes, US, VDB). Figure 61.

Herba perennis densicaespitosa, tenella, glabra; radices graciles. Folia linearia, 4–6 cm longa, erecta vel leviter expansa, vaginis scaporum longiora. Laminae planae vel leviter tortae, 0.9–1.2 mm latae, vaginis 3–5-plo longiores, longitudine distincte multinervosae, ferrugineae vel olivaceae; apices contracti, incurvato-acuti; margines incrassati, minute ciliati; vaginae carinatae, carinibus persaepe minute rufociliatis, incrassatis, lateribus valde longitudine multicostatae, pallide vel intense ferrugineae, marginibus in laminas gradatim convergentibus, ad apicem ligulam acutam 0.5 mm longam fascientes, infime gradatim dilatatae. Vaginae scaporum laxae, plerumque apertae, tortae, basin versus nitidae, a medio carinatae, laminis aut similibus laminis foliorum aut brevibus. Scapi subteretes, filiformes, plus minusve spiraliter torti, 1.2–2 dm alti, ca. 0.4–0.5 mm crassi, olivacei, distaliter acute bicostati, costis laevibus. Spicae subglobosae vel late obovoideae, 4.5–6 mm longae, plurifiorae, breviter attenuatae; bracteae steriles 2(–4), paro infimo oblongo, 2–2.5 mm longo, areis dorsalibus linearibus bracteam aequantibus; bracteae fertiles arcte spiraliter imbricatae, late ovatae, obovatae, suborbiculatae, aut reniformes, ca. 3 mm longae, convexae et leviter carinatae, obtusae vel subtruncatae, ad apicem utrinque erosae et ciliatae, scariosae, minute tuberculato-rugulosae, a medio ad basim multo crassiores, nitidae, brunneolae, marginibus effuse et pectinate rigofimbriatis; area dorsali ovata, ca. 2–2.5 mm longa, glauca. Sepala lateralia ca. ½ connata, ca. 2 mm longa, inaequilateralia, lobis acutis scariosis, ala carinali angusta, integra. Laminae petalorum anguste obovatae, ca. 1.5 mm longae, ad apicem rotundatae, laceratae, luteolae. Staminodia aliquantum redacta, bibrachiata, brachiis ad apicem breviplumosis, pilis moniliformibus. Antherae oblongae, ca. 0.3–0.4 mm longae, loculis parallelis distinctis; filamenta ca. 0.5 mm longa. Capsula dorsali-ventraliter compressa, oblongo-cylindrica, tenuissima, 1.2–1.3 mm longa; placenta basalis. Semen solitarium, lenticulariter oblongo-ellipsoideum, 1–1.2 mm longum, translucidum, pallide luteo-brunneolum, longitudine subtiliter striatum.

Delicate, smooth, cespitose perennial; roots slender. Leaves linear, 4–6 cm long, erect or somewhat spreading, longer than the scape sheaths; blades 3–5 times longer than the sheaths, plane or slightly twisted, 0.9–1.2 mm wide, longitudinally distinctly multinerved, strongly flattened, ferrugineous to olive green; apices contracted, incurved-acute; margins thickened, minutely ciliate; sheaths carinate, with carinae minutely red-ciliate, incrassate, the sides strongly longitudinally nerved, pale to deep red-brown, the margins gradually converging into the blade, at apex producing an acute ligule 0.5 mm long, gradually dilating below. Sheaths of scales lax, mostly open, twisted, shining toward the base, carinate at the middle, with blades either similar to those of principal leaves or shorter. Scapes subterete, filiform, ± spirally twisted, 1.2–2 dm high, ca. 0.4–0.5 mm thick, olivaceous, sharply costate distally, the costae smooth. Spikes subglobose to broadly obovoid or short-cylindric, 4.5–6 mm long, several-flowered, short-attenuate; sterile bracts 2 (–4), the lowest pair oblong, 2–2.5 mm long, with dorsal areas linear and equal to them in length; fertile bracts tightly spirally imbricate, broadly ovate, obovate, suborbicular, or reniform, ca. 3 mm long, convex and slightly carinate, obtuse to subtruncate at apex on either side, erose, scarious, minutely rugulose-tuberculate, much thicker from the middle to the base, shining, brownish, with margins effusely and pectinately rigidly fimbriate; dorsal area ovate, ca. 2–2.5 mm long, gray-green. Lateral sepals ca. ½ connate, ca. 2 mm long, inequilateral, the lobes acute, scarious, the carinal keel narrow, entire. Petal blades narrowly obovate, ca. 1.5 mm long, apically rounded, lacerate, yellow. Staminodia somewhat reduced, bibrachiate, the branches at apex short-plumose with moniliform hairs. Anthers oblong, ca. 0.3–0.4 mm long, the locules parallel, distinct; filaments ca. 0.5 mm long. Capsule dorsiventrally compressed, oblong-cylindric, very thin, 1.2–1.3 mm long;

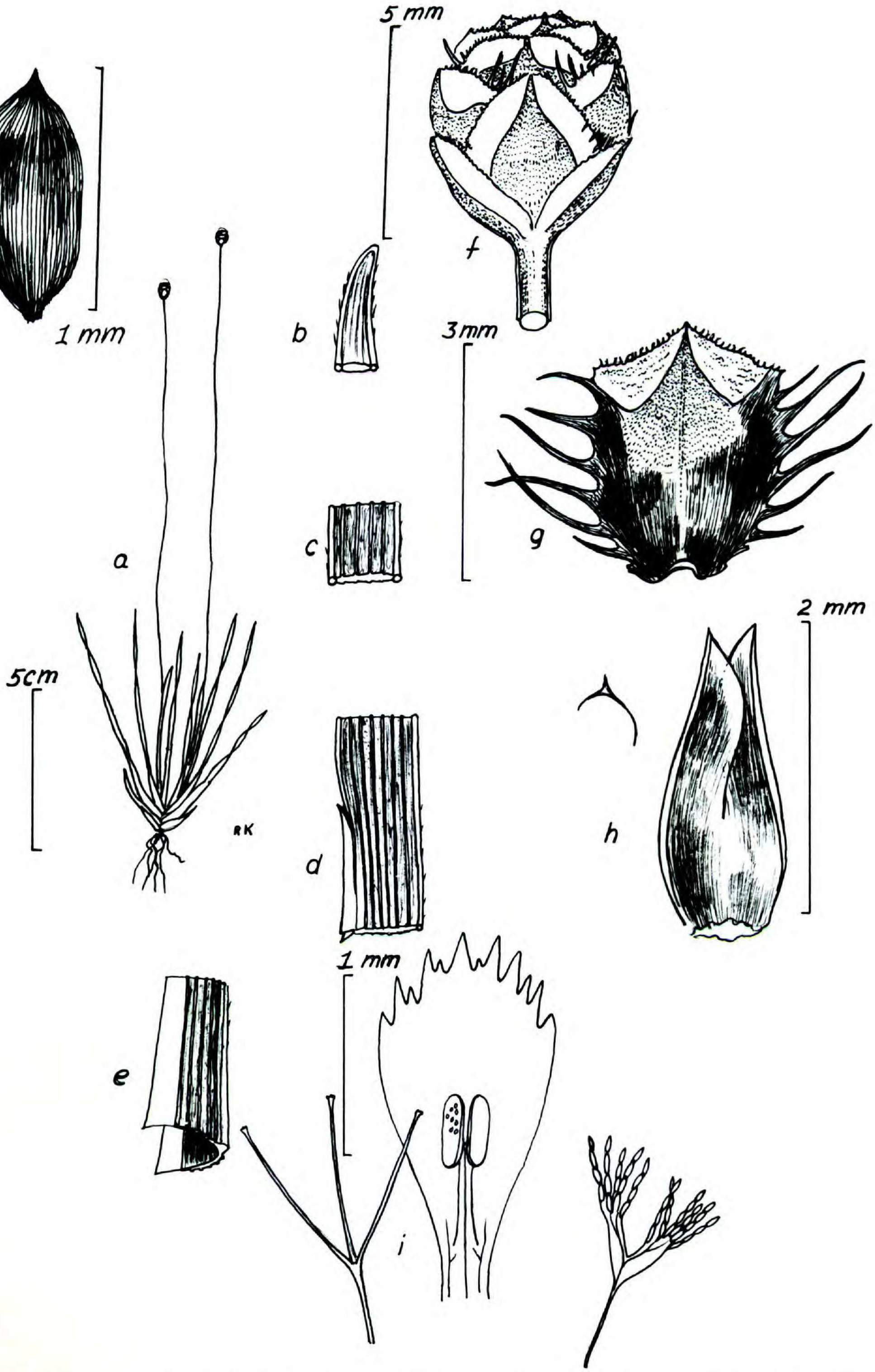


FIGURE 61. Xyris pectinata (T. R. Bahia 35).—*a. Habit sketch.—b. Leaf tip.—c. Sector of midblade.—d. Blade–sheath junction.—e. Leaf base.—f. Spike.—g. Fertile bract.—h. Lateral sepals.—i. Stylar apex, petal blade, stamen, staminodial apex.—j. Seed.*

placenta basal. Seed solitary, lenticularly oblong-ellipsoid, 1–1.2 mm long, filling capsule, translucent, pale yellow-brown, finely longitudinally striate.

Additional specimens examined. BRAZIL. AMAZONAS: Transamazona Highway, 53 km W of Aripuaná River; "campina" region, common in open campina of white sandy soil, 27 June 1979, *C. E. Calderón, O. P. Monteiro & J. Guedes 2696* (INPA, US, VDB); Município de Borba, acima de Terra Preta, campina do Rio Surubím, afluente do Rio Abacaxis, 4°29′S, 58°33′W. Campina aberta, areia branca. Erva de 10 cm de altura; flores amarelas, 4 July 1983, *C. A. Cid 4026* (INPA, NY, VDB).

This species is easily distinguished by its fringe of strong though slenderly tapering rigid bristles on the margins of the fertile bracts, nearly separate anther locules, and reduced staminodial condition. It is unusual in its particularly small and thin-walled capsule, this tightly filled by a single large seed.

62. Xyris savanensis Miq., Linn. 18: 605. 1844. TYPE: "Surinam, Berlyn, *Focke 1022*" (holotype, U). Figure 62.

Solitary or cespitose, soft-based annual 1–5 dm high; stem contracted. Leaves spreading flabellately to erect, (2–)5–20(–25) cm long; sheaths ½ or less as long as blades, entire, red-brown to tan or brown, papillose-rugulose, narrowing gradually from wide base to blade, there with an erect, narrowly triangular ligule to 0.5 mm long, or eligulate; blades flat, slightly twisted, gladiate-linear, 1–5 mm wide, narrowing gradually above middle to a narrowly acute apex, the margins slightly thickened or not thickened, papillose to scabrid, surfaces mostly rugose-scabrid. Scape sheath shorter than leaves, multicostate and tubular, keeled, open and short-bladed above. Scapes straight or flexuous, twisted, terete or subterete distally, 0.5–1 mm thick, ecostate to tricostate or striate, the costae and surfaces scabridulous or papillose (rarely nearly smooth). Spikes ovoid to cylindric, ellipsoid or subglobose, 0.3–0.7(–1) cm long, with many spirally imbricate bracts, these tan or reddish brown with darker green or maroon dorsal areas; sterile bracts smaller than fertile bracts, grading into them, the fertile bracts broadly obovate to suborbicular, 3–5 mm long, the apex broadly rounded, entire, backs strongly convex-rounded, ecarinate. Lateral sepals free, very inequilateral, elliptic, ca. 3 mm long, acute to obtuse, the strong, curvate keel irregularly ciliate and/or ciliolate. Petal blades broadly obovate, yellow, 2–2.5 mm long. Staminodia bibrachiate, the lance-linear branches beardless. Anthers oblong, ca. 0.5 mm long, deeply emarginate and sagittate on filaments about as long. Capsule broadly obovoid, 1.5–2.5 mm long, placentation basal. Seeds numerous, ellipsoid or ovoid, 0.4–0.5 mm long, apically truncate and minutely apiculate, the body pale yellow-brown or red-brown, translucent, faintly 20–24-ribbed and indistinctly cross-lined.

Distribution. South America, from the Andean foothills eastward, mostly at low to medium elevations, south into Argentina. Records of this species from Mesoamerica have all turned out to be *X. paraensis*. It is so commonly collected that even a partial citation of records (as in the case of the equally common *X. jupicai*, *X. laxifolia*, *X. fallax*) is better done separately.

It is not surprising that a widespread, common, and weedy xyris would show considerable variation in habit and in character of indumentum, pigmentation, and other features. Thus two additional varieties, *X. savanensis* var. *glabrata* Seubert, (Fl. Bras. 3(1): 217. 1855) and var. *procera* (Malme) Malme (Ark. Bot. 13(3): 53. 1913), have been described along with some forms. The former variety, as the name suggests, has totally smooth foliage, while the latter assumes (sometimes?) a perennial habit. The species nearest it taxonomically is *X. paraensis*, and here would be a great difficulty were it not for a pair of characters that, regardless of variety, appear to hold throughout the range. All specimens of *X. savanensis* lack bearded staminodes; all have seed uniformly truncate at apex, there with a short but distinguishable apiculus.

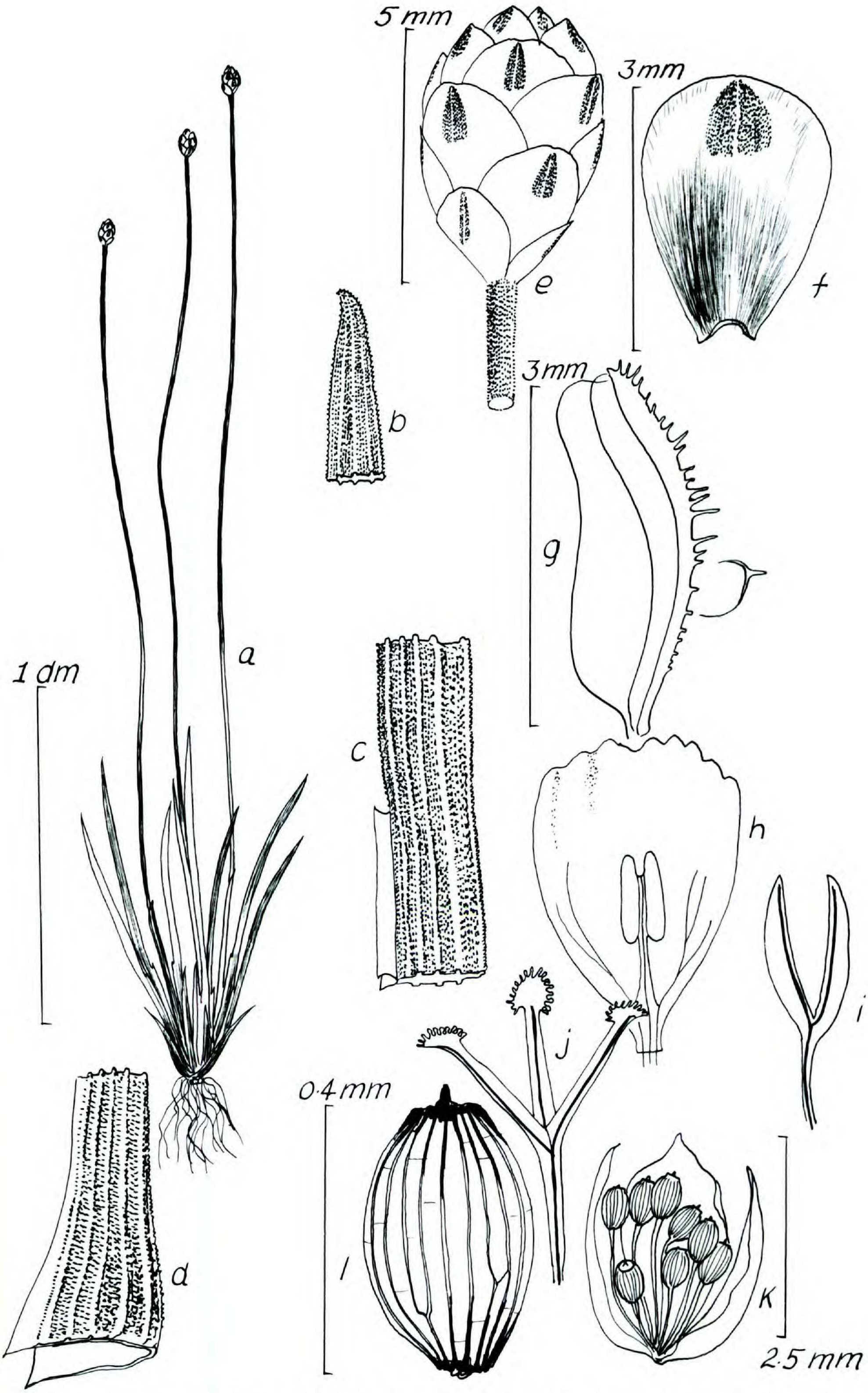


FIGURE 62. Xyris savanensis (Huber 5744, Wurdack & Adderley 43307).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at junction of sheath and blade.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Dehiscing capsule.—l. Seed.*

63. Xyris surinamensis Sprengel, Tent. Suppl. Syst. Veg. Linn. 2. 1828. TYPE: "Suriname, *Weigelt*, 1827" fide J. Lanjouw, Rec. Trav. Bot. Neerl. 34. 1937. Possibly (fide Lanjouw) based on same material as *X. eriophylla* Reichenb., but still a problem, the marked type not found. Figure 63A, B.

X. eriophylla Reichenb., Pl. Excic. Weigelt, 1827 (?). TYPE: Surinam, Leg. & Exc. *Weigelt 1827* (?lectotype at Delessert Herbarium; isolectotype, MO; phototype, GH).

Cespitose, hard-based, often bulbous, stocky perennial 2.5–4 dm high. Leaves often nearly as long as scapes, ascending or slightly spreading, 1.5–3 dm long; sheaths long-ciliate, usually with brownish hairs, the dilated base ecarinate, red to purple or deep brown, rugose, gradually narrowing to leaf blade, mostly eligulate; blades linear, flattened, 2–4 mm wide, often twisted, dull green, abruptly blunt-tipped or incurved-acute to incurved-narrowly rounded, the margins mostly pale, incrassate, ciliate or scabrociliate, rarely papillate; surfaces rugulose, strongly nerved, the strongest nerves often pale-incrassate, often hirtellous or scabridulous. Scape sheaths highly variable, keeled, from much shorter than leaves and elaminar to nearly as long and similar in blade. Scapes flexuous, twisted, flattened, distally 2–3 mm wide with strong costae comprising edges, often with one or both costae pale pilose-ciliate or scabrid, the sides pale yellow-green, strongly rugose, sometimes with additional lower costae. Spikes subglobose or broadly turbinate, 0.8–1 cm long, of many spirally imbricate or subdecussate, stiff, dull brown or red-brown, ciliolate or entire bracts with large, ovate dorsal areas. Sterile bracts ovate-triangular, slightly keeled, lower bracts much smaller than the fertile bracts and grading into them, the fertile bracts oblong to obovate, 6–8 mm long, slightly carinate, apically obtuse-angled or narrowly rounded, the dorsal area of lower ones venose and sometimes white pilose. Lateral sepals free, subequilateral to inequilateral, lance-linear, curvate, 5–7 mm long, acute, the firm keel lacerate, villosulous or ciliolate from middle to apex. Petal blades broadly obovate, 5–6 mm long, yellow, the broadly rounded apex erose-denticulate. Staminodia bibrachiate, the slender branches densely long penicillate-ciliate. Anthers oblong, ca. 2 mm long, deeply bifid and sagittate, on filaments ca. 1.5 mm long. Capsule narrowly to broadly obovoid, 4–5 mm long, the placentation appearing basal-central, but the valves dehiscing to reveal strong septa. Seeds few, cylindric-fusiform, ca. 1 mm long, pale amber, faintly longitudinally striate and cross-lined, often additionally with a few, conspicuous, irregular, dark red-brown ribs.

Distribution. Locally abundant in low- to high-elevation savanna from southeastern Colombia eastward across southern Venezuela into French Guiana, southward into Amazonas and Pará, Brazil.

Selected specimens examined. BRAZIL. AMAZONAS: Serra Aracá, 10 Feb. 1975, *Pires 15000* (MG, US, VDB); margens de um riacho da serra Aracá, 1 Nov. 1978, *Rosa & Lira 2343* (US). COLOMBIA. AMAZONAS: scrub savanna, Araracuará, Río Caquetá, 5 Sep. 1959, *Maguire et al. 44111* (NY, VEN). VAUPÉS: Cerro Yapobodá, 5 Oct. 1951, *Schultes & Cabrera 14234-A* (GH); Cerro Kanenda, ca. 800–900 ft., 10 Nov. 1952, *Schultes & Cabrera* (GH). GUYANA: Saesdyke, Nov. 1973, *Cooper 51* (U); N Rupununi, Apr. 1968, *Davis 773* (K); Wenamu Trail, Krabu Savanna, 28 Oct. 1966, *Forest Dept. Brit. Guiana Field No. R. B. 139*, Record No. *7972* (K); Rupununi Distr., Chaakoitou, near Mountain Point, 26 Oct. 1979, *Maas & Westra 4051* (K, U, US); Pakaraima Mts., Mt. Membaru, ca. 400 m, 12 Nov. 1979, *Maas & Westra 4342* (K, U, US); Pakaraima Mts., Kako Amerindian vill., 13 Nov. 1979, *Maas & Westra 4371* (U, US); same locality, Mt. Aymatoi, 1,150 m, 15 Oct. 1981, *Maas et al. 5691* (NY, U, VDB); Kopinang Savanna, Kopinang Falls, 2,700 ft., 30 Aug. 1961, *Maguire et al. 46015* (K); Kaietur Savanna, 1,100 ft., 7 Sep., *Sandwith 1420* (U); Kaietur Savanna, 30 Aug. 1933, *Tutin 659* (U). SURINAM: Zanderij, 21 Mar. 1959, *van Donselaar 479* (U); Zanderij, Kruid, 21 Dec. 1950, *Florschutz 737* (U); same locality, 22 July 1933, *Lanjouw 135* (U); Upper Commewijne River, W of Sapende, 14 July 1953, *Lindeman 4241* (C, U); Iter secundum surinamense, July–Sep. 1920, 28 July, *Pulle 45* (U); Nat. Res. Brinckheuvel (Saban Pasi Savanne), 2 Sep. 1967, *Wildschut & Teunissen 11602* (U). VENEZUELA. T. F. AMAZONAS: Serranía del Parú, 1,100 m, 3–4 Oct. 1979, *Huber 4287, 4323, 4331* (VEN), *4333* (US); sabana ubicada en la margen derecha (E) del bajo Río Pacimoni, *Huber & Medina 5871* (VEN, VDB); summit Cerro Guanay, 1,800 m, 2 Feb. 1951, *Maguire et al. 31701* (NY, VEN); Caño Hechimoni, 8 km above mouth Río Siapa, 9 Feb. 1954, *Maguire et al. 37637* (GH, NY, VEN); Esmeralda between Esmeralda Savana and

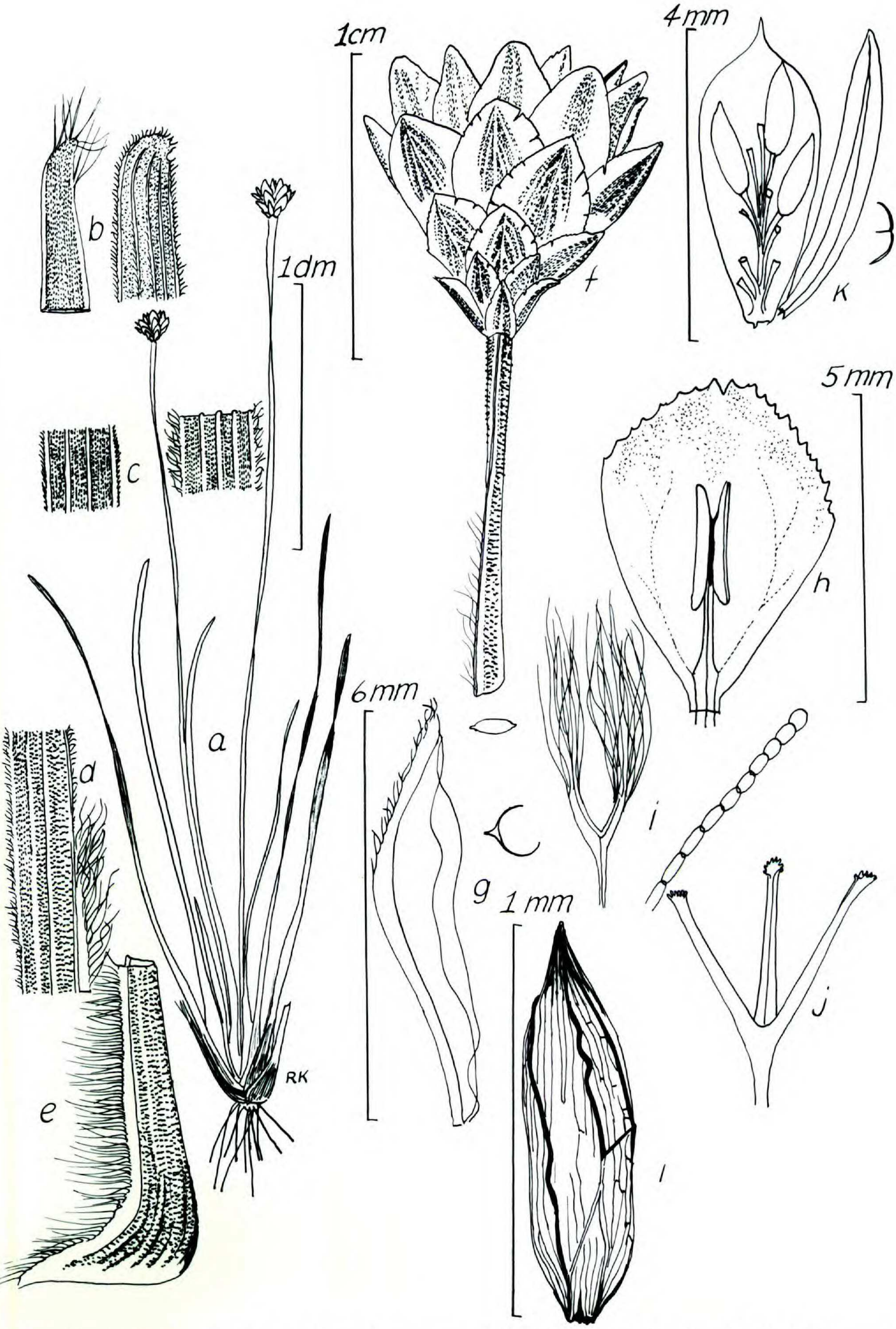


FIGURE 63A. Xyris surinamensis *(*Kral 70568, Steyermark 58405*)*.—*a. Habit sketch.*—*b. Leaf apex*, Kral 70568 *at left*, Steyermark 58405 *at right.*—*c. Leaf at midblade*, Kral 70568 *at left*, Steyermark 58405 *at right.*—*d. Leaf at sheath apex.*—*e. Leaf base.*—*f. Spike.*—*g. Lateral sepal.*—*h. Petal blade, stamen.*—*i. Staminode, enlarged apex of beard hair.*—*j. Stylar apex.*—*k. Capsule.*—*l. Seed.*

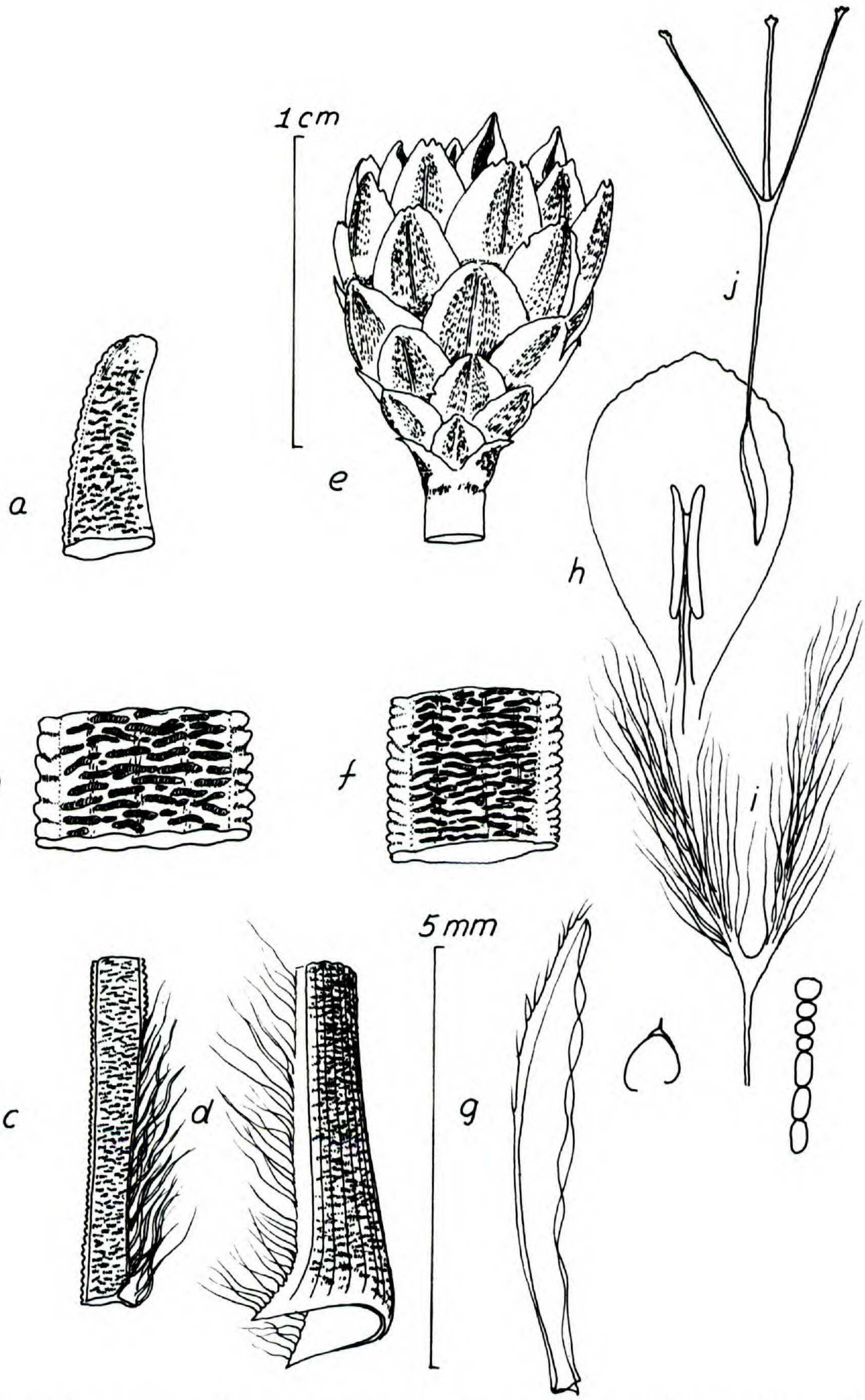


FIGURE 63B. Xyris surinamensis *(*Pires 15000*)*.—*a. Leaf apex.—b. Sector of leaf midblade.—c. Leaf–sheath junction.—d. Leaf base.—e. Spike.—f. Sector of upper scape.—g. Lateral sepal.—h. Petal, stamen.—i. Staminode.—j. Stylar apex.*

Sabana Grande, NE of Esmeralda, 6 Sep. 1944, *Steyermark 58405* (F, NY); Grand Savanna, Esmeralda, ca. 325 ft., 1 Nov. 1928, *Tate 304* (C, NY). BOLÍVAR: cerca de San Rafael de Camoiran, ca. 1,240 m, 8 Jan. 1982, *Cordero y Utrera 5* (PORT); ca. 17 km al NE de Ikabaru, ca. 1,100 m, *Huber et al. 6723* (MYF, VDB, VEN); cerca de la ribera Norte del Río Carrao medio, ca. 8–10 km al NNE de la confluencia Carrao–Churun, 31 Aug. 1983, *Huber et al. 8270* (NY); al E del Churí-tepui en el Vallé del Río Karuay inferior, 18 Nov. 1984, *Huber*

9794 (MYF, VEN, VDB); ca. 5 km al norte del Poblado San Francisco de Yuruaní, 19 Jan. 1985, *Huber 9949* (MYF, VDB); el piedemonte septentrional del Cerro Zumbador, *Huber 10271* (MYF, VDB); ca. 35 km al W del caserio de Chiguao, 23 Mar. 1985, *Huber 10354* (MYF, VDB); 1.5 km E of Kavanayen in Gran Sabana, bog, 27 July 1983, *Kral 70536* (BM, F, L, MO, NY, SP, U, US, VDB, VEN, and others); Salto Yuruani, 28 July 1983, *Kral 70568* (BM, F, K, L, MO, NY, SP, U, US, VDB, VEN, and others); El Pauji, savanna E of town, 2 Nov. 1985, *Liesner 19357* (MO, VDB, VEN); savanna vic. Uriman, 300 m, 30 Apr. 1953, *Steyermark 75265* (C, F, NY, VEN).

As one might suspect from such a wide geographic distribution, the species is highly variable in stature, leaf dimensions, and in indumentum of scapes, leaves, and sepals. Its pale yellow blooms with broad petals expand in morning.

64. Xyris pratensis Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 34, fig. 19A–E. 1963. TYPE: Venezuela. T. F. Amazonas: pubescent, frequent in wet hummocks, Camp Savanna, Campo Grande, 1,500 m, Cerro Sipapo (Paraque), 10 Dec. 1948, *Maguire & Politi 27581* (holotype, NY; isotypes, GH, US). Figure 64.

Cespitose, slender, hard-based perennial 4–5.5 dm high, the stems short, ascending, covered by chaffy bases of old leaves. Leaves erect, 2–4 dm long; sheaths sparsely pilose-ciliate, as long as blades or longer, abruptly constricted above the dilated, deep red-brown base, then narrowing upward and keeled to blade, the margins intermittently pilose-ciliate; blades narrowly linear, flat, 2–3 mm wide, slightly narrowing above middle then abruptly incurved-acute or obliquely acute, the thickened tip often white bristly-ciliate, the margins thin, pale ciliate, the surfaces green with streaks of red, strongly multinerved. Scape sheaths somewhat shorter than leaves, above with strong blades like leaves but narrower. Scapes somewhat compressed distally, ca. 1–1.5 mm wide, elliptic in cross section, with the two costae making edges, strongly pale ciliate or with one costa smooth. Spikes ellipsoid, becoming obovoid, 8–10 mm long, the several bracts subdecussate, rather loosely imbricate, dark red-brown with distinct and usually paler dorsal areas, firm, the sterile bracts narrower and shorter than the fertile bracts, the lowermost keeled, sometimes pilosulous-ciliate, grading into fertile bracts, these oblong, bluntly acute or narrowly rounded, entire or apically villosulous, 6–7.5 mm long, the backs convex, ecarinate but with dorsal areas bisected by a strong costa. Lateral sepals equaling bracts or slightly longer, free, subequilateral, linear-oblanceolate, 7–8 mm long, acute, the dark, firm keel entire or above middle low-lacerate and also often minutely ciliate. Petal blades obovate, ca. 5.5 mm long, yellow, apically broadly acute. Staminodia bibrachiate, the flat branches densely penicillate-pilose. Anthers lance-oblong, deeply bifid, sagittate, 1.5 mm long, on filaments 1 mm long. Capsule ellipsoid, 3–3.5 mm long, placentation central, the valves with strong septa toward base, thus actually placentation axile there. Seeds several, narrowly ellipsoid, ca. 1 mm long, pale amber with a conic white apiculus, the body longitudinally finely but distinctly ribbed.

Distribution. High savanna, cerros Sipapo (Paraque) and Marahuaca, southern Territorio Federal Amazonas, Venezuela, infrequent.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: summit Cerro Marahuaca, 2,685 m, 15 Jan. 1981, *Maguire 65635* (NY, VDB); cumbre del Cerro Paraque, 1,600 m, alto Orinoco, *Phelps 20* (US); Cerro Sipapo, 17 Feb. 1981, *Steyermark 124532* (NY, VDB, VEN).

This species is very evidently closely related to *X. bicostata* Maguire & Lyman B. Smith of Cerro Huachamacari in Amazonas, which differs only in that the plants are (mostly) lower, with smaller and fewer-flowered spikes, and narrower scapes and leaves.

65A. Xyris bicostata Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 30, fig. 14A–F. 1963. TYPE: Venezuela. T. F. Amazonas: frequent on mossy rocky banks, dense woodlands along right fork of Caño de Dios, 1,800 m, Summit Camp, Cerro Huachamacari,

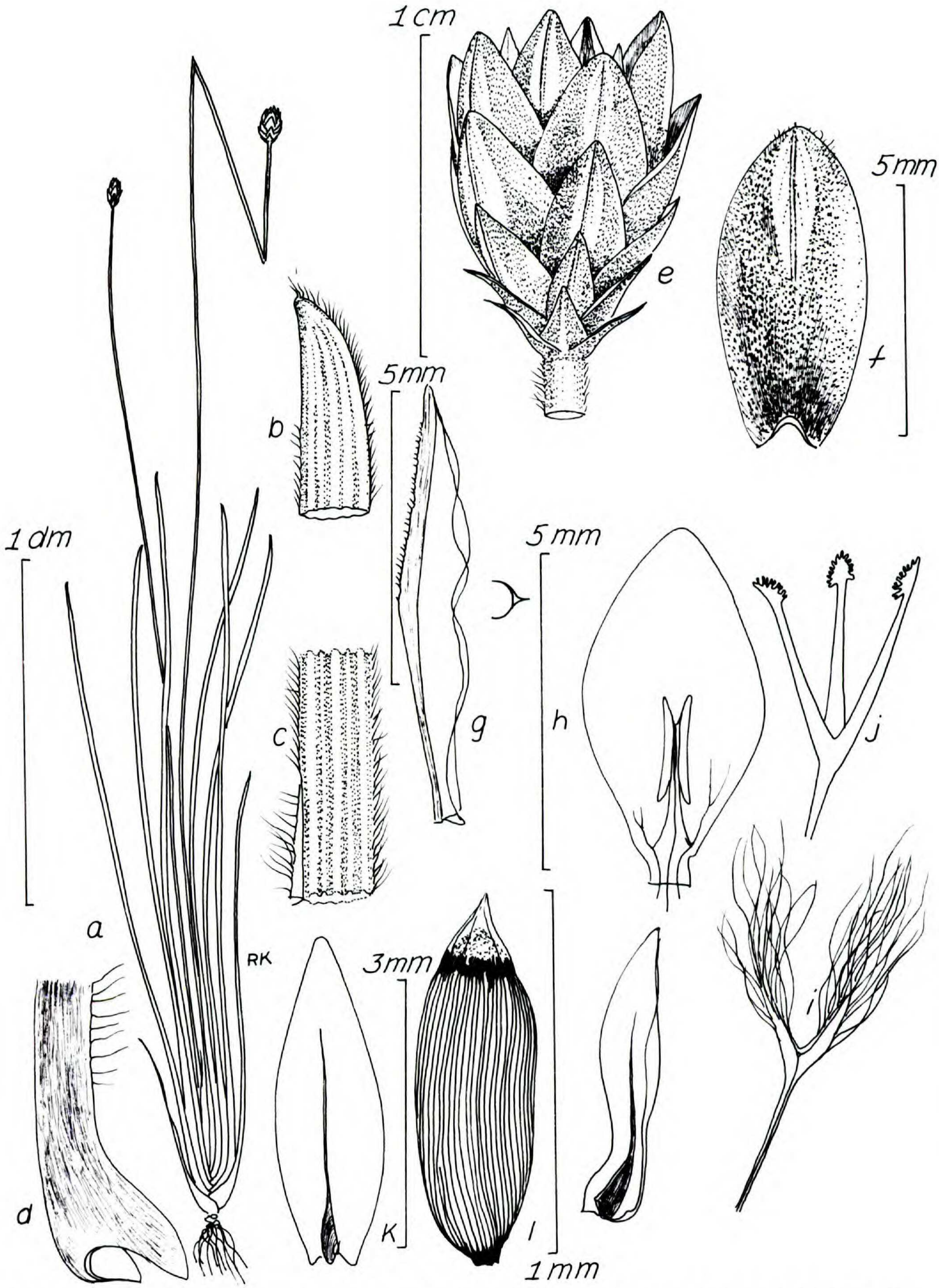


FIGURE 64. Xyris pratensis *(from the type)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule valve (two views, one on each side of seed sketch).—l. Seed.*

Río Cunucunuma, 13 Dec. 1960, *B. Maguire, R. Cowan & J. J. Wurdack 30169* (holotype, NY; isotypes, NY, US, VEN). Figure 65.

Cespitose slender perennial 2–3 dm high, the stems short, with base sometimes forming a short, stout rhizome. Leaves erect, 1–2 dm long; sheaths over ½ as long as blades, at very base red-brown ciliate, medially and distally pilose-ciliate with red-brown hairs, tapering gradually to blade, eligulate, the surfaces smooth or papillose-rugulose toward base; blades flat, narrowly linear, 0.8–1 mm wide, the apex abruptly conic-acute or terete-rounded, the margins finely ciliate to scabrociliate, the surfaces smooth and punctate, few-nerved, smooth or papillose toward base. Scape sheaths loose, as long as leaves, with long, strong blades. Scapes straight or slightly flexuous, lineal, 0.8–1 mm wide, oval distally in cross section, strongly bicostate, costae paleciliate or scabrociliate. Spikes narrowly obovoid, ellipsoid, aging obconic, 9–10 mm long, red-brown, few flowered; bracts subdecussate, the sterile bracts ca. 6, the lowest ones narrowly triangular, strongly keeled, grading into fertile bracts, these oblong or lance-ovate, 7.5–8 mm long, broadly acute or rounded, entire, carinate and keeled apically and with paler, linear-elliptic dorsal areas, often also with faint but evident arcuate lateral nerves. Lateral sepals free, subequilateral, ca. 6–7 mm long, lance-linear, narrowly acute, firm, pale red-brown, the narrow, firm keel entire. Petal blades narrowly obovate, ca. 6 mm long, yellow, the broadly acute apex irregularly dentate. Staminodia bibrachiate, the narrow flat branches penicillate pubescent toward and at apex. Anthers oblong, ca. 1.5 mm long, deeply bifid and auriculate, on filaments ca. 0.5 mm long. Capsule narrowly ellipsoid, ca. 4 mm long, the placentation appearing free-central, but capsule valves with shallow septa at base. Seeds numerous, ellipsoid, ca. 1 mm long, both ends acute, the body amber, finely longitudinally ribbed.

Distribution. A high-tepui endemic, thus far found on Cerro Marahuaca and on Cerro de La Neblina, along the Brazil–Venezuela border, as well as at the type locality, Cerro Huachamamacari. The specimens from Marahuaca and Neblina are uniformly different enough from the type to have been recognized as a species by Smith, who related them more to *X. tatei* Malme and named them *X. tillettii*. The material seems, however, to represent a varietal extreme of *X. bicostata*, particularly in its prominent, sharp and prominent, scabrociliate pairs of scape costae, and in its general spike and sepal dimensions. Yet the leaves are narrower than in the type, also slightly thicker and blunter, and the spike scales are less prominently keeled (though evidently costate) and are less spreading at maturity. Thus, the following is proposed:

65B. Xyris bicostata var. **tillettii** (Lyman B. Smith) Kral, stat. nov. *Xyris tillettii* Lyman B. Smith, Ernstia 9: 3–4. 1982. TYPE: Venezuela. T. F. Amazonas: Cerro Marahuaca, al NE de, y casi contigua con, Cerro Duida, este inmediatamente al N de La Esmeralda 3°10′N, 65°31′W, en el Río Orinoco, ca. 2,750 m, 2 & 9 Feb. 1975, *S. S. Tillett, P. Colvee et al. 752-332* (holotype, VEN; isotype, US).

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: plateau of Cerro de Marahuaca above Salto Los Monos on trib. headwaters of Río Iguapo, 3°37′N, 65°23′W, 2,555 m, 25 Feb. 1985, *Liesner 17962* (MO, VEN, VDB); Cerro Marahuaca, parte central de la Meseta Sur-este, 10–12 Oct. 1983, *Steyermark 129442* (VDB, VEN); Cerro de La Neblina, Planicie de Zuloaga, Río Titirico, 2,300 m, 10–15 Oct. 1970, *Steyermark 103845* (NY, VDB); Valle de Titirico N of Pico Phelps in Cerro Neblina, ca. 2,200 m, bog, 1 Dec. 1984, *Kral et al. 71920, Kral 71927* (NY, VDB, VEN, and to be distributed).

66. Xyris globosa Nilsson, Bih. Kongl. Svenska Vetensk.-Akad. Handl. 24(14): 57, pl. 3. 1892. TYPE: Venezuela. T. F. Amazonas: "prope Esmeralda ad flumen orinoco, Dec. 1853, *R. Spruce 3244*" (lectotype, S; possible isolectotype, NY). Figure 66.

Solitary or cespitose, slender but stiffish, bulbous-based perennial 3–7 dm high, the

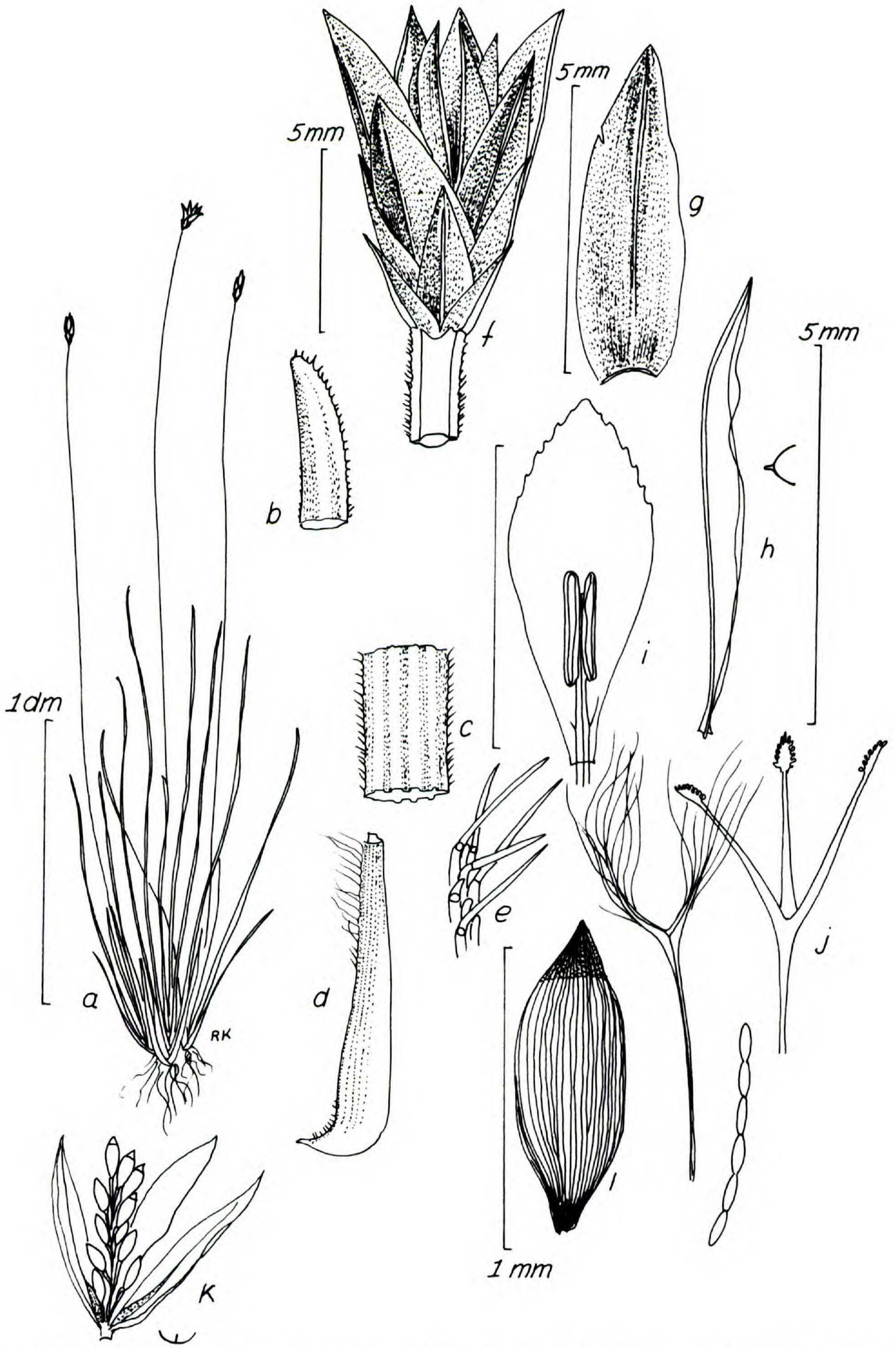


FIGURE 65. Xyris bicostata *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade, midsector.—d. Leaf base.—e. Enlarged small sector of leaf blade edge.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Staminode, enlarged sector of beard hair, stylar apex.—k. Dehisced capsule showing placentation and two septa.—l. Seed.*

stems contracted. Leaves erect, outermost scalelike, castaneous, the principal ones with sheath ⅛ or less the length of the blade, the base orbicular-dilated, villous-ciliate, castaneous, narrowing abruptly above, then tapering gradually into blade, this narrowly lineal, twisted, ca. 1 mm broad, slightly compressed with rounded-incrassate edges, the apex abruptly or narrowly conic, the surface smooth, longitudinally few ribbed, green. Scape sheaths much shorter than leaves, loosely convolute, multicostate, essentially bladeless. Scapes twisted, flexuous, terete, 0.7–1 mm thick, green, smooth, shallowly multiribbed or striate. Spikes broadly ovoid to subglobose or hemispherical, 5–10(–15) mm long, blunt, dull red-brown or tan, of many loosely and spirally imbricate bracts, these with pale-scarious borders, lacerate, white villous-ciliate, with distinct, narrow dorsal areas. Sterile bracts numerous, the lowest much the smallest, grading gradually to fertile bracts, these oblong to obovate, ca. 5(–7) mm long, broadly rounded, ecarinate or slightly carinate, the backs slightly convex-rounded. Lateral sepals free, subequilateral, linear-oblanceolate or oblong, ca. 5 mm long, obtuse, the sharp, alate keel pale-villous fimbriate or fimbriociliate with pale hairs from middle to apex. Petal blades narrowly obovate or elliptic, ca. 4.5–5.5 mm long, yellow, the apex broadly acute, the margins subentire. Staminodia bibrachiate, the broadly rectangular branches glabrous. Anthers narrowly oblong, deeply bifid and sagittate, ca. 1 mm long, on filaments ca. 0.7–1 mm long. Capsules deep brown, broadly obovoid, 2.5–3 mm long, the placentation basal-central, the valves lacking septa. Seeds numerous, oblong-ellipsoid, ca. 0.5–0.6 mm long, pale amber, apiculate, longitudinally with fine but distinct and anastomosing ribs.

Distribution. Mostly in low-elevation white-sand savanna in southwestern Venezuela (Territorio Federal Amazonas), particularly along the middle and upper Orinoco and tributaries; possibly in Colombia.

Selected specimens examined. VENEZUELA. T. F. AMAZONAS: La Esmeralda, Alto Orinoco, Jan.–Feb. 1969, *Farinas et al. 571* (VEN); Canaripo, bajo Río Ventuari, 11 Oct. 1977, *Huber 1064* (US); a unos 30 km al SE de la confluencia Orinoco–Ventuari, 30 Nov.–1 Dec. 1978, *Huber & Tillett 2819* (US); SSE de Sta. Barbara del Orinoco, ca. 100 m, 4 Dec. 1978, *Huber & Tillett 2852* (US); bajo Río Ventuari, ca. 10 km al E del Caserio de Carmelitas, 20 Feb. 1979, *Huber 3241* (US); W del Caño Pimichín un poco al sur del caserio Pimichín, 24 Feb. 1979, *Huber 3395* (US); also Caño Yagua, a unos 30 km al W de la Serranía El Tigre, 29 Feb. 1980, *Huber 4846* (VEN); 15 km N de Esmeralda, 8 Mar. 1980, *Huber 5059* (VEN); 20 km al NW Yavita, cabeceras Caño Pimichín, 11 Feb. 1981, *Huber & Medina 5948* (VDB, VEN); Savana el Venado, left bank Caño Pimichín above Pimichín, 23 Nov. 1953, *Maguire et al. 36360* (NY, US); Cerro Moriche, Río Ventuari, base Cerro Moriche, 17 Jan. 1951, *Maguire et al. 30992* (GH, NY, US, VEN); Cerro Moriche, cumbre, 4,500 ft., 15 Jan. 1951, *Maguire et al. 30936* (NY, US); Yapacana, Savanna III, 31 Dec. 1950, *Maguire et al. 30475* (NY, US, VEN); Cerro Moriche, 800 m, 14 Jan. 1951, *Maguire et al. 30897* (NY, US); Canaripo, 125 m, 28 Dec. 1976, *Steyermark & Redmond 112801* (MO, US, VDB, VEN); Cerro Yapacana, 8–9 Nov. 1979, *Thomas & Rogers 2610* (NY). BOLÍVAR: Cerro de Auyantepui, *Cardona 262* (US, VEN); morichal 2 km E of Río Orinoco between Río Horeda and Cerro Gavilan (Cerro Carighang), 100 m, 17 Dec. 1955, *Wurdack & Monachino 39952* (NY, US).

This, fuzzy-spiked plant, common in the Orinoco savannas, appears closest to *X. laceratа* Pohl and *X. lanulobractea* Steyerm., with the lacerate bract of the former but having villose-ciliate borders, and with the villose-ciliate border of the latter, yet with leaf bases villose-ciliate and more bulbous. It appears to be rare in low-altitude savanna in western Estado Bolívar. The leaf blades, if at all compressed, are thickened so that they have no sharp edge, something hard to reflect in key construction.

67. Xyris arachnoidea Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 28, fig. 12A–E. 1963. TYPE: Venezuela. T. F. Amazonas: flowers yellow, occasional, Savanna III, northwest base of Cerro Yapacana, 150 m, alto Río Orinoco, 17 Mar. 1953, *B. Maguire & J. J. Wurdack 34570* (holotype, NY; isotype, US). Figure 67.

Cespitose, hard- and fibrillose-based, subbulbous perennial 2.5–4 dm high, the stems contracted. Leaves erect, 1–2 dm long; sheaths dull brown, the very base abruptly

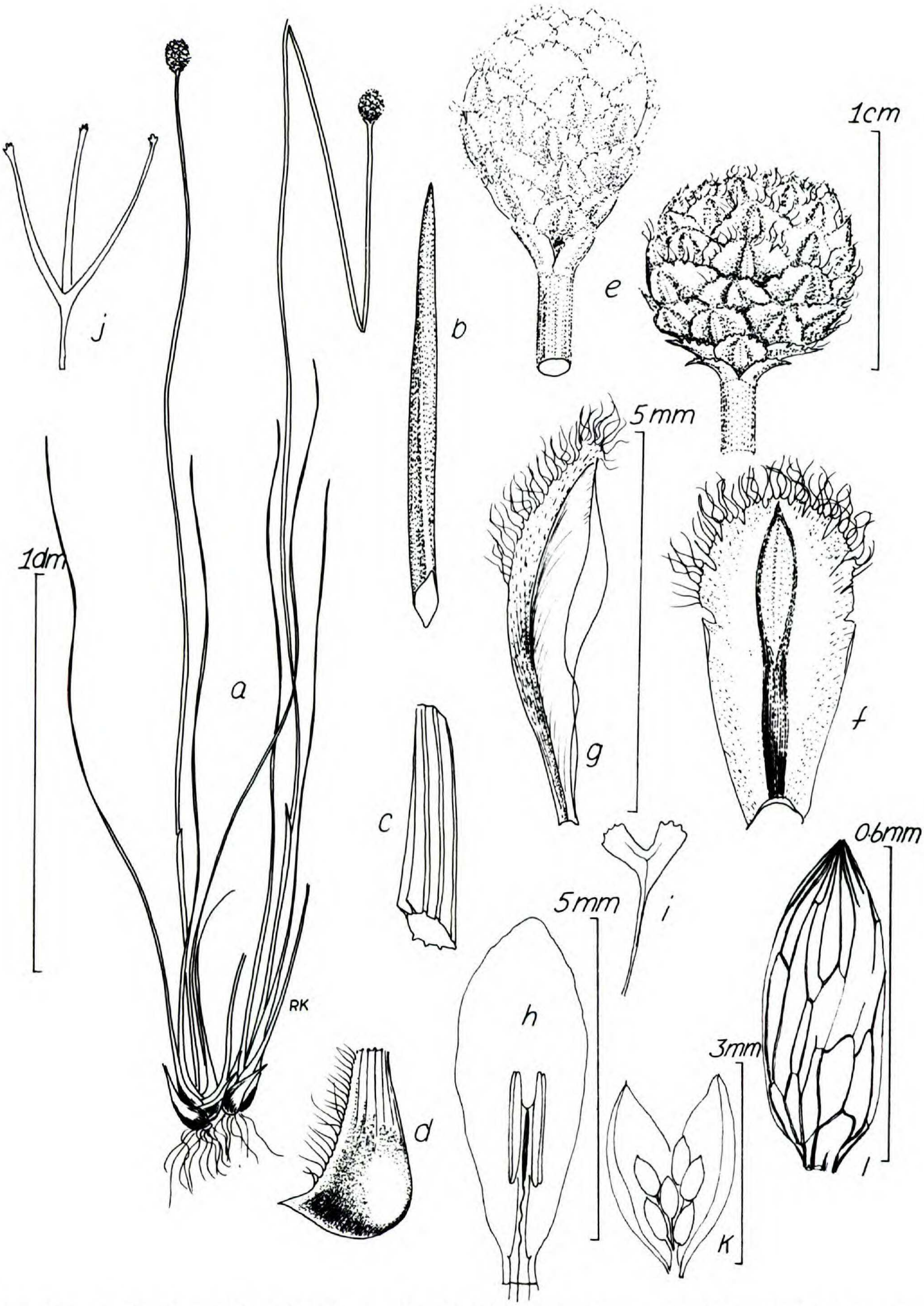


FIGURE 66. Xyris globosa (Huber 3395).—*a. Habit sketch.—b. Leaf tip.—c. Leaf at sheath–blade junction.—d. Leaf base.—e. Spikes, two types.—f. Fertile bract.—g. Lateral sepal.—h. Petal, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule, one valve removed showing placentation.—l. Seed.*

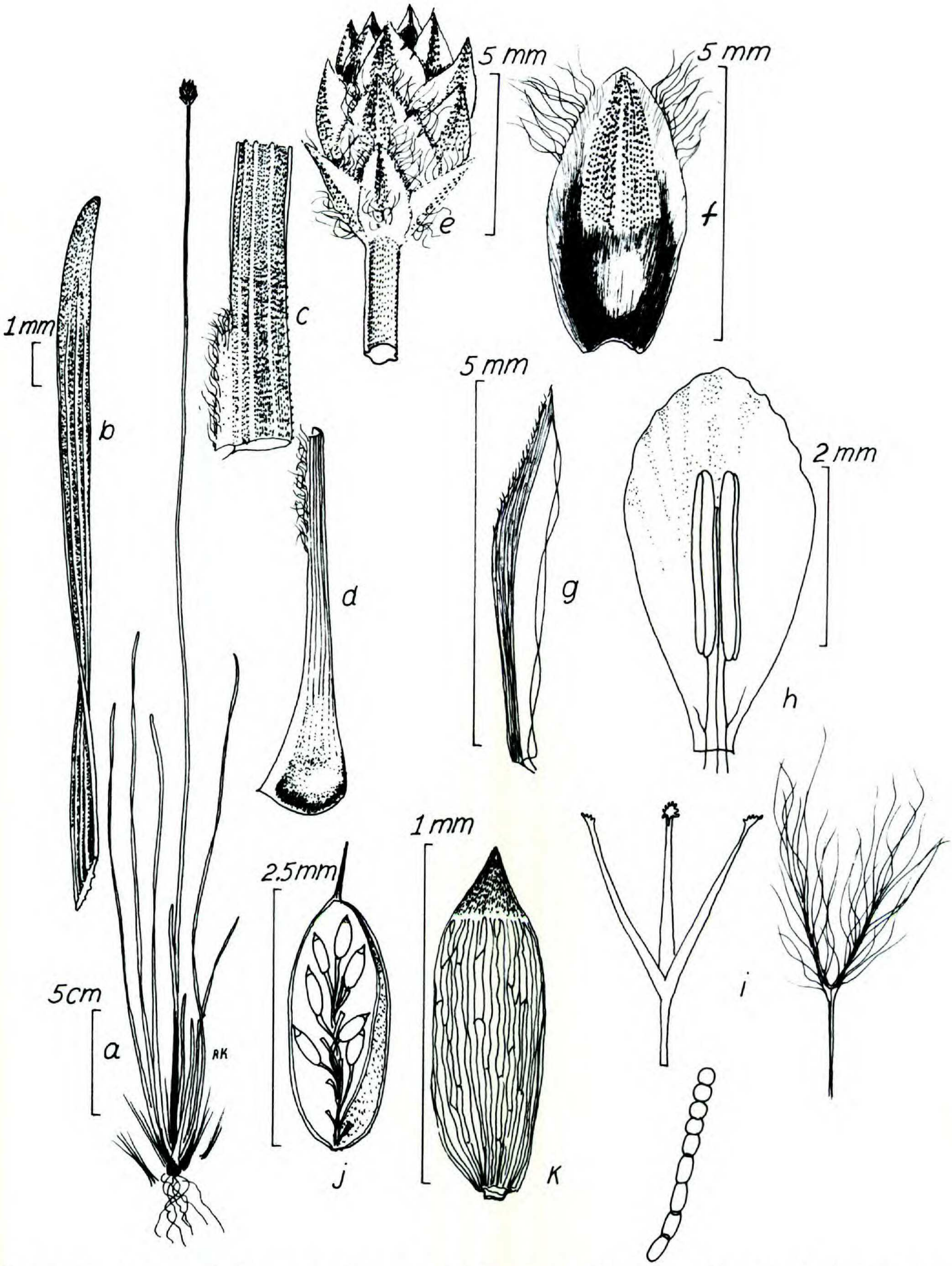


FIGURE 67. Xyris arachnoidea *(a–e from type, f–k from* Kral 70710*)*.—*a. Habit sketch.—b. Leaf tip and upper blade.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade and stamen.—i. Staminode, style branches, enlarged staminodial hair.—j. Capsule, side view of one septum (shaded), placentation.—k. Seed.*

dilated, castaneous, above tapering gradually into blades and white-villous- or lanate-margined, the ligule concealed by cottony hairs; blades evenly linear, at least 5 times as long as sheaths, flattened, ca. 1 mm wide, abruptly narrowed to a callused, narrowly rounded apex, the margins entire or scabrid toward base, rather thick, sometimes pale and con-

trasting, sometimes with 1 edge double, the surfaces smooth or papillose-scabrid or rugulose toward base, sometimes with a few strong, yellowish nerves, otherwise dull green or maroon. Scape sheaths much shorter than leaves, thin, keeled and open, apically with short, erect, stiff blades. Scapes flexuous and twisted, apically subterete or oval in cross section, ca. 1 mm thick, 2–4-costate, the costae yellowish, low, smooth. Spikes ovoid, drying obovoid, 7–8 mm long, blunt, dull brown, of several spirally imbricate, firm but loose bracts, the sterile bracts narrowly to broadly triangular, grading slightly larger into fertile bracts, these ovate, 4–5 mm long, acute with margins (sometimes also backs) white villose and with strong, red-brown triangular dorsal areas. Lateral sepals free, subequilateral, curvate-lanceolate, 4.5–5 mm long, acuminate, lustrous red-brown, thin, the darker, wide, firm keel with a sparse fringe of villosulous or scalelike ascending hairs, villosulous at tip, aging subentire. Petal blades obovate, ca. 5 mm long, yellow, the narrowly rounded tip erose. Staminodia bibrachiate, the branches long, slender, long-penicillate from tip to base. Anthers oblong, ca. 2 mm long, ca. 2.5–3 mm long, the placentation free-central, the capsule valves septate. Seeds numerous, narrowly ellipsoid or cylindrical, ca. 1 mm long, apiculate, translucent pale brown with numerous, very fine, wavy, longitudinal ribs and some fine cross-lines.

Distribution. Locally abundant in sandy low-elevation savanna along the upper Orinoco, Territorio Federal Amazonas, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: SE bank of mid part of Caño Yagua at Cucurital de Yagua, ca. 120 m, *Davidse et al. 17403* (MO), *17435* (MO, US); Cerro Yapacana, 22 May 1981, *Guánchez 1164* (TFAV, VDB); el pie occidental del Cerro Yapacana, 14–28 Feb. 1978, *Huber 1617* (US); alrededores de Canaripo, 30 May 1978, *Huber 1914* (US, VEN); Savanna III, Cerro Yapacana, 3 June 1978, *Huber 2029* (VEN), *2040* (US); entre el medio Caño Yagua y el bosque al N del Cerro Cucurito, 18 Jan. 1979, *Huber 3136* (US); Caño Caname, ca. 18 km arriba (al E) de la boca, 29 May 1979, *Huber et al. 3749* (US); alto Caño Yagua, a unos 30 km al W de la Serranía El Tigre, 29 Feb. 1980, *Huber 4846a* (VEN); Savanna II, W base Cerro Yapacana, ca. 100 m, 10 Aug. 1983, *Kral & Huber 70710* (F, K, L, MO, NY, SP, US, VDB, VEN); Cerro Yapacana en la sabana grande el Caño Cotua, 7 May 1970, *Steyermark & Bunting 103243* (US, VEN).

This species is fairly common in the savannas around Cerro Yapacana and much resembles the more widespread and associated *X. subglabrata* Malme (*X. garcia-barrigae* Idr. & Smith). It differs, however, in having much more copious white villous or arachnoid pubescence on the bracts and in having distinctly flattened (rather than terete) leaf blades. The flowers are open in the morning, closed by mid afternoon.

68. Xyris malmeana Lyman B. Smith, Bol. Inspet. Fed. Obras Contra Secas, Rio 10: 126. 1939. TYPE: Brazil, Pará: open sandy soil 2 km S of Vigia, *Drouet 2136* (holotype, GH). Figure 68.

Xyris glabrata (Seub.) Griseb. sensu Griseb., Fl. Brit. W. Ind. 525 (Trinidad), not as to basionym *X. savanensis* Miq. var. *glabrata* Seub.

Slender, solitary or cespitose, glabrous perennial 4–6 dm high, the stems contracted. Leaves erect, 1–3 dm long; sheaths ciliate, pink to deep brown, the abruptly dilated base gradually narrowed, strongly ribbed and ecarinate into the blade, this flattened, narrowly linear, twisted, 1.5–3 mm wide, gradually narrowed above middle to a narrowly acuminate or subulate apex, the margins thin, smooth, the surfaces pale green, finely nerved. Scape sheaths much shorter than principal leaves, strongly ribbed, twisted, also keeled, with a cusplike blade apically. Scapes slenderly linear, straight or flexuous, twisted, subterete at apex, ca. 0.5 mm thick, with 3 or more low but sharp and distinct, smooth or papillose costae. Spikes broadly ellipsoid or ovoid, 5–8 mm long, acute, pale red-brown or dull brown, of several spirally imbricate, convex, ecarinate, entire to lacerate bracts with distinct dorsal areas, the sterile bracts slightly smaller than the fertile bracts, grading into them, the fertile bracts 4–6 mm long, broadly elliptic to obovate, broadly or narrowly rounded apically, sometimes the inner ones slightly keeled, all with a short, narrow,

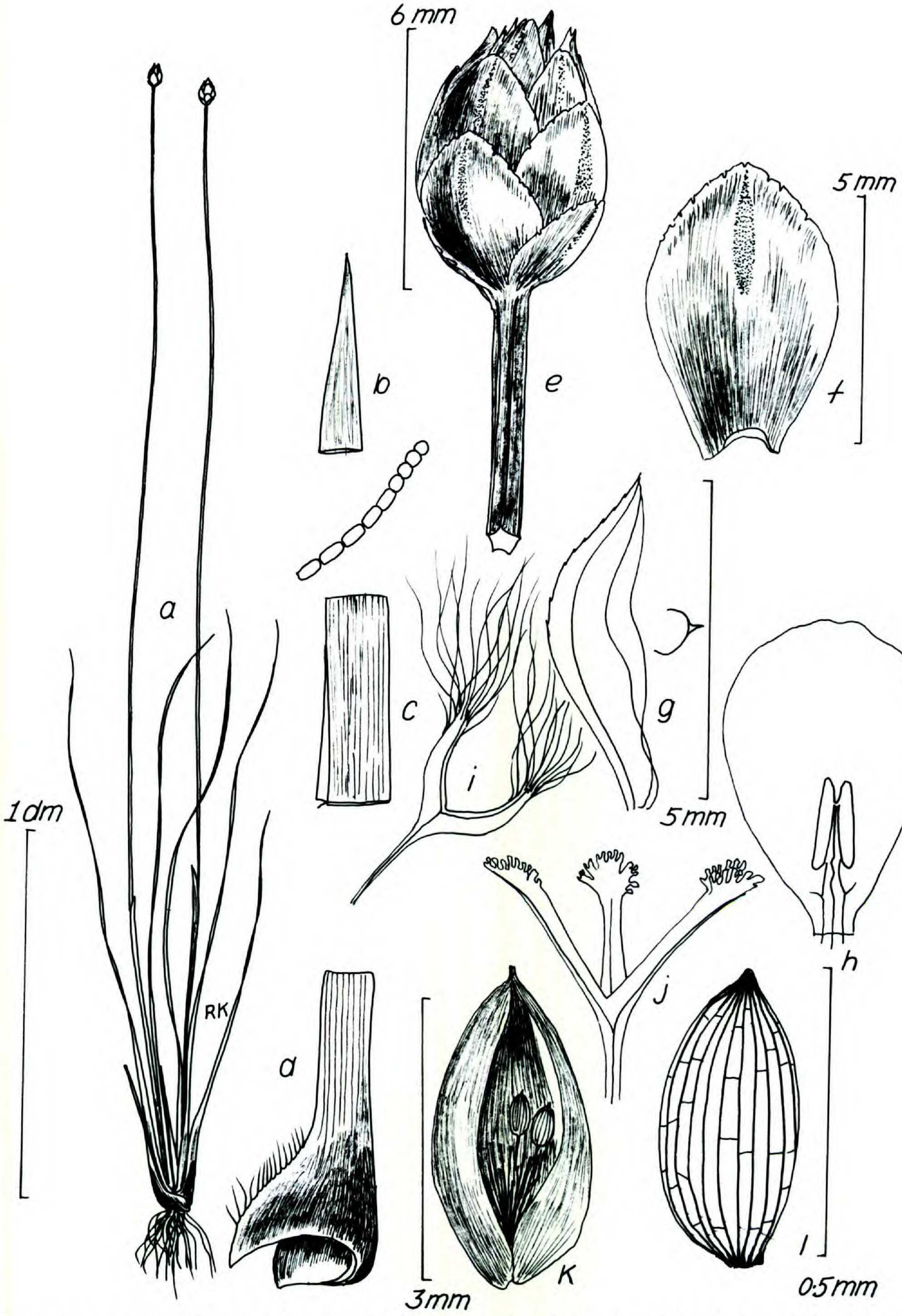


FIGURE 68. Xyris malmeana *(*Steyermark & Dunsterville 113285*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule.—l. Seed.*

usually greenish dorsal area. Lateral sepals free, slightly inequilateral, thin, elliptic-curvate, ca. 5 mm long, acute, the broad, firm keel lacerate-ciliolate from middle to apex, or nearly entire. Petal blades obovate, ca. 4 mm long, yellow, the broadly rounded apex subentire. Staminodia bibrachiate, the narrow, flat branches distally penicillate-ciliate. Anthers ca. 1 mm long, lance-oblong, deeply bifid and sagittate, on filaments 0.3–0.4 mm long. Capsule obovoid, firm-valved, 3.5–4 mm long, the placentation basal, the valves without septa. Seeds numerous, broadly ellipsoid, ca. 0.5 mm long, 2-apiculate, deep lustrous amber, finely ribbed longitudinally.

Distribution. Sandy, low- to high-elevation savanna, northern South America from Territorio Federal Amazonas, Venezuela, eastward to French Guiana and in contiguous northern Brazil in Amapá, Amazonas, Guapore, and Pará; Trinidad.

Selected specimens examined. BRAZIL. AMAPÁ: Camp 27.VI.1904, *A. Ducke s.n.* (MG, US). AMAZONAS: estrada Humaita–Lábrea, km 17, 10 June 1982, *Teixeira et al. 1059* (INPA, NY, VDB). GUAPORE: Porto Velho, *Cordeiro & Da Silva 272* (US). PARÁ: Vigia, campina do Palha, 10 Aug. 1954, *Black 54-16761* (US, VDB); Obidos, Jaramacaru River, 27 May 1957, *Egler 300* (US); Gurupa, campina da Gerenalda, *Pires & Silva 4712* (US, VDB). FRENCH GUIANA. Route de Simonmary, environs in 70 km, 7 June 1957 (*no collector name*—U). GUYANA: Rupununi Savanna, ca. 350 ft., 9 Aug. 1936, *Goodland 336* (US). SURINAM: Soesdyke, Oct. 1977, *Cooper 354* (U); Gros-savanna (prope km 103) opn. 309.8, Apr. 1959, *Van Donselaar 697* (U); Zanderij I, Aug. 1914, Essed (U); Jodensavanne (fluv. Suriname), *Heyligers 235* (U); near Singri Lanti 15 km W of Zanderij, 24 July 1976, *Jansma 13* (U); Tapfelberg, distr. Saramacca, *Kramer & Hekking 3275* (U); Tibiti savanne near km 5.8 in third line, 15 Jan. 1949, *Lanjouw & Lindeman 1850* (GH, U); savanna near Sapende, upper Commewijne River, 14 July 1953, *Lindeman 4233* (GH, U); Tapfelberg, savanna I, 3 Aug. 1944, *Maguire 24203* (NY, U); Sipaliwini savana area on Braz. Frontier, 255 m, 4 Sep. 1968, *Oldenburger et al. 58* (U); Nat. Res. "Brinckheuvel," 2 Sep. 1967, *Wildschut & Teunissen 11570* (U). TRINIDAD: Aripo Savanna, 21 Apr. 1920, *Britton et al. 1996* (GH, NY, US); Aripo-savanne, Manzanilla, 7 Feb. 1962, *Hekking 1347* (U). VENEZUELA. T. F. AMAZONAS: 20–25 km W de San Juan de Manapiare, 8 Oct. 1979, *Huber 4491* (US); Esmeralda, 9 Oct. 1928, *Luetzelburg 22498* (US). BOLÍVAR: SE base Auyan-tepui, 24 Nov. 1982, *Davidse & Huber 22565* (MO, VDB); 3 km S of El Pauji, 1,050 m, 19 Oct. 1985, *Holst & Liesner 2630* (MO, VDB, VEN); sabanas al SW de Kamarata, 23 Nov. 1982, *Huber et al. 6810* (MYF, VDB, VEN); Caserio de Kukenan, ESE de la punta SE del Churí-tepui, *Huber 9768* (MYF, VDB); flats above Río Yuruani at Salto Yuruani, 28 July 1983, *Kral 70572* (MO, NY, US, VDB, VEN); 1.3 km N of Río Yuruani Ferry, ca. 750 m, 29 July 1983, *Kral 70619* (NY, US, VDB, VEN); above Ven. 10, ca. 800 m, and N of Ferry, Puente Kumerepa, 17 Dec. 1984, *Kral 72189* (MYF, VDB, VEN—a large set to be distributed); cumbre de Cerro Guaiquinima, salto del Río Szczerbanari, 20–25 Jan. 1977, *Steyermark & Dunsterville 113285* (NY, US, VEN); Auyan-tepui, 1,100 m, Dec. 1937–Jan. 1938, *Tate 1316* (NY).

This species most resembles *X. lacerata* Pohl ex Seub. However, *Xyris malmeana* is usually lower, is more slender, and is less bulbous based. Its scapes are more sharply costate, its dorsal areas are narrower, and its lateral sepals are less ciliate.

69. Xyris araracuare Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 34, fig. 20A–F. 1963. TYPE: Colombia. Amazonas: frequent in scrub savanna, Araracuará, Río Caquetá, 5 Sep. 1959, *B. Maguire, C. K. Maguire & A. Fernandez 44132* (holotype, NY; isotype, US). Figure 69.

Slender, somewhat cespitose, bulbous-based perennial 2–3 dm high. Older leaves short, scalelike, covering "bulb." Main foliage leaves few, ascending, 10–20 cm long; sheaths ciliate, much shorter than blades, abruptly flaring at base, castaneous, ligule absent, tapering gradually above into blade, this green, subterete, fluted, lineal, twisted, 0.7–0.8 mm wide, smooth or scaberulous along lateral ribs, abruptly bluntly conic. Scape sheaths shorter than leaves, loose, blade short, cusplike. Scape straight or flexuous, twisted, terete and slightly grooved or fluted, punctate distally, proximally ribbed and scaberulous. Spike broadly obovoid, 7–8 mm long, blunt, many-flowered, pale dull brown, the bracts loosely spirally imbricate; sterile bracts mostly 6, broadly ovate or triangular, the lowest smallest, narrowly scarious-lacerate-bordered, grading gradually to fertile bracts, these ovate, ca. 5.5 mm long, the tips narrowly rounded, lacerate-bordered, the backs rounded with darker, lance to linear dorsal areas; innermost bracts more navicular, more acute, subentire,

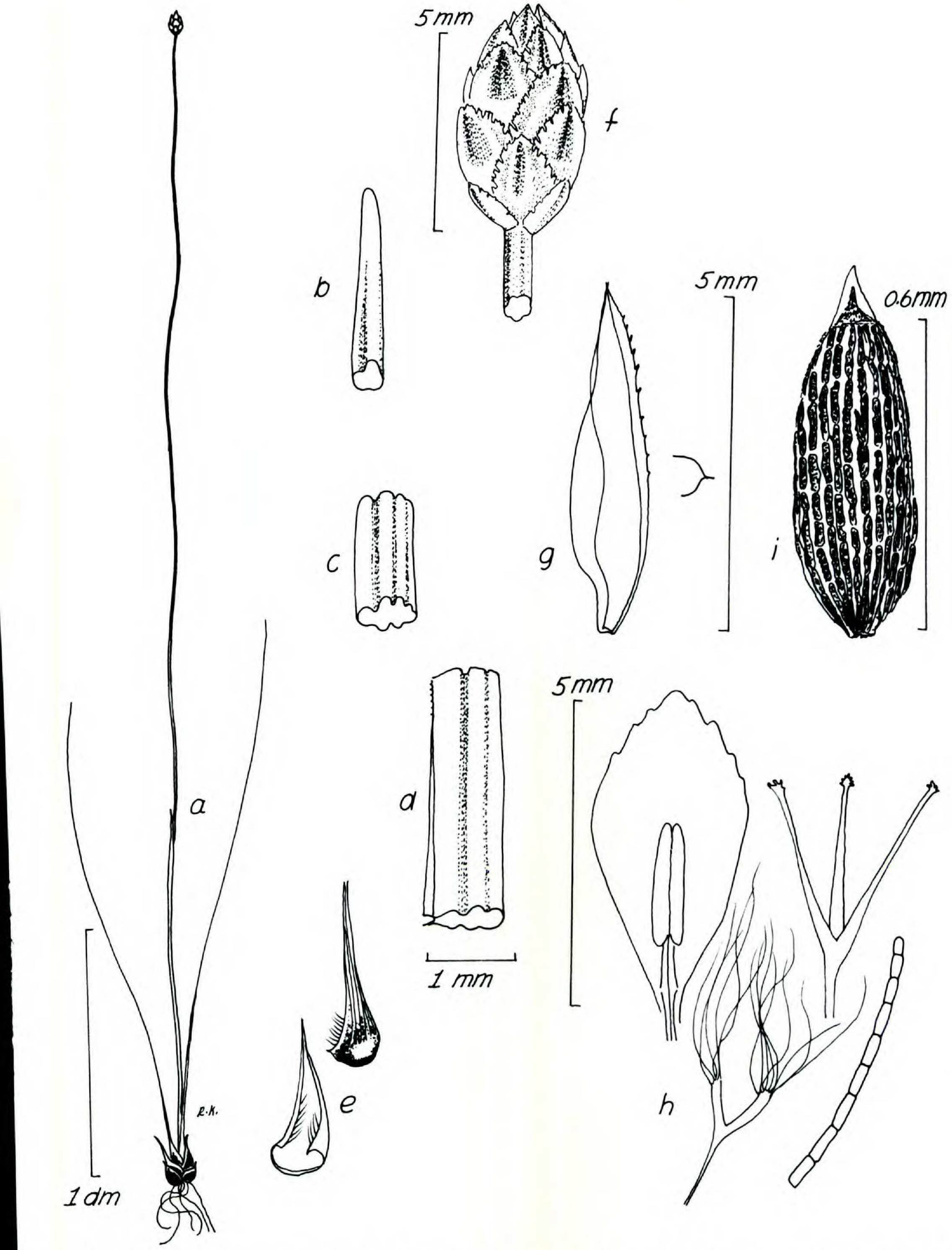


FIGURE 69. Xyris araracuare *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Sector of lead mid-blade.—d. Leaf at junction of sheath.—e. Two views of leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen, staminode, style branches, enlarged beard hair.—i. Seed.*

to 6 mm long. Lateral sepals free, subequilateral, elliptic-linear, ca. 4.5(–5.5) mm long, narrowly acute, pale brown except for darker, narrow, firm keel, this ciliate-scabrid from ca. middle to apex. Petal blades yellow, obovate, ca. 5 mm long, narrowly rounded apically, sparsely dentate. Staminodia bibrachiate, the branch apices sparsely long-penicillate. Anthers oblong, ca. 2 mm long, on filaments 0.5 mm long. Capsule narrowly obovoid, 2.5 mm long; placentation basal, funiculi long. Seeds numerous, narrowly lance-ovoid to ellipsoid, 0.6 mm long, translucent, longitudinally with several broad, wavy, distinct ribs.

Distribution. Sandy scrub savanna, known only from the type collection.

Evidently this species is very close to the widespread *X. lacerata* Pohl ex Seub., as the descriptions and illustrations show. It is best to include it now with that perspective until the entire genus is revised for South America.

70. Xyris lacerata Pohl ex Seub. in Martius, Fl. Bras. 3(1): 26, pl. 26. 1855. TYPE: Brazil: "Goias, *Pohl*" (isolectotype, BR; phototype, US no. *5752*). Figure 70.

Tall, bulbous-based, solitary or cespitose perennial 4–6 dm high, the stems contracted, the outer leaves scalelike, castaneous. Principal leaves 1.5–3 dm long, erect or ascending; sheaths less than ¼ length of blades, at base abruptly dilated, ciliate, cochleariform, usually castaneous, papillose-rugulose; above paler, entire, gradually tapering to blade, papillose-rugulose, eligulate; blades narrowly linear, flattened, or rarely thickened, subterete, twisted, 1.5–3 mm wide, acute to narrowly acuminate, often subulate, the edges thin or cartilaginous-incrassate, smooth or papillose, the surfaces dull green, smooth or papillose-rugulose, multinerved. Scape sheaths much shorter than leaves, tight, proximally twisted and multicostate, opening and keeled distally, producing a cusplike blade. Scapes twisted, straight or flexuous, terete distally, 0.5–1 mm thick, striate, ecostate or with 1 low costa, smooth to papillose. Spikes globose, broadly ovoid or hemispherical, 0.5–1 cm long, dull brown, of very many spirally imbricate, convex-rounded, lacerate and scarious-edged bracts having distinct, green to red-brown dorsal areas; sterile bracts several, distinctly smaller than and grading into fertile bracts, these oblong to obovate, 6–7 mm long, broadly rounded, ecarinate, and with broadly lacerate scarious borders (innermost fertile bracts narrower, frequently keeled). Lateral sepals free, slightly inequilateral, oblong-curvate, ca. 5.5–6 mm long, blunt, lustrous red-brown, the firm, narrow keel ciliolate from near base to tip. Petal blades obovate, 5.5–6 mm long, yellow, the rounded apex erose. Staminodia bibrachiate, the narrow flat branches long-penicillate from near base to tip. Anthers lance-oblong, ca. 2 mm long, shallowly bifid, deeply auriculate, on filaments ca. 0.5 mm long. Capsule narrowly ellipsoid, ca. 5 mm long, the placentation densely central, the valves lacking septa. Seeds numerous, broadly to narrowly ellipsoid or fusiform, 5–6 mm long, deep amber, 15–20-ribbed with much fainter crosslines.

Distribution. Sandy or sandy-silty or rocky campos and savannas, eastern Colombia eastward across southern Venezuela and probably into Guyana but with no official record; to the south, from the Andean foothills eastward from northern Brazil south into Argentina.

Selected specimens examined. Only northern records are listed. COLOMBIA. META: E of Río Zanza, 2 km above jct. with Río Cuejar, ca. 500 m, 22 Aug. 1950, *Idrobo & S. Smith 1544* (F); Villa Vicencio, 450 m, 26–31 Aug. 1917, *Pennell 1409* (NY); Savan. Boca de Monte, llanos de San Martín, *Smith & Idrobo 1391* (GH, NY); 2 km E Río Zanza, N end Cordillera Macarena, 22 Aug. 1950, *Smith & Idrobo 1543* (GH); Llanos Orientales, La Macarena (Parte Sur), Río Guayabero, sabanas, 235–700 m, Jan.–Mar. 1959, *García-Barriga & Mejia 17078* (NY). SANTANDER: Mesa de Los Santos, 1,500 m, *Killip & A. C. Smith 15139, 15190, 15280* (GH, NY). VAUPÉS: Mesa La Lindosa, ca. 15–20 km sur de San José del Guaviare, 13–15 Dec. 1950, *Idrobo & Schultes 674* (GH, U); lower Río Parana-pichuna, 10 Sep. 1976, *Zarucchi 2012* (GH). VENEZUELA. T. F. AMAZONAS: La Esmeralda, 15 July 1951, *Croizat 115* (NY, US); 15 km E Puerto Ayacucho, 30 Sep. 1960, *Foldats 3539* (NY, VEN); Aeropuerto de Puerto Ayacucho, 24 Aug. 1977,

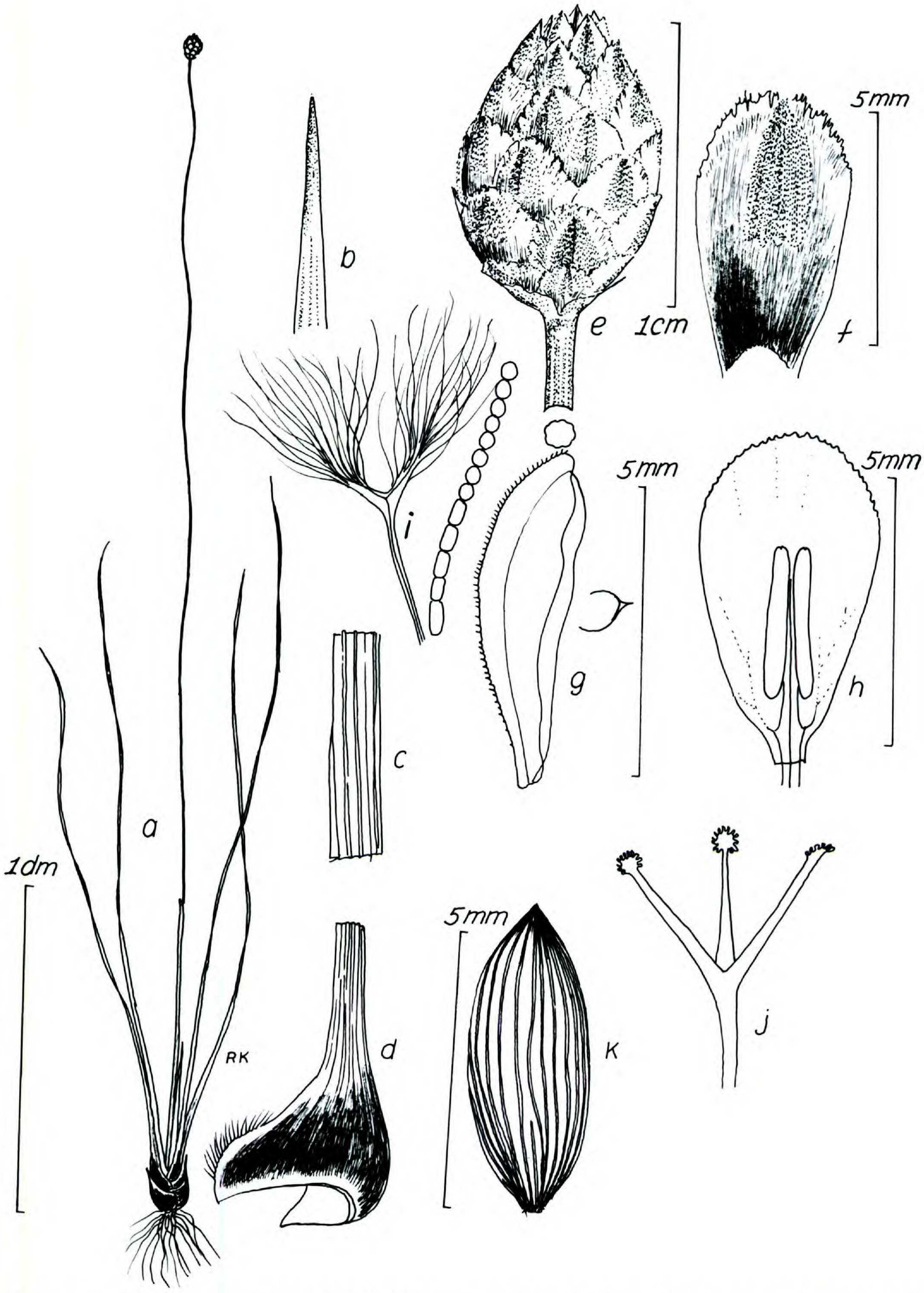


FIGURE 70. Xyris lacerata (Delascio et al. 11152).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Seed.*

Huber 1000 (US, VEN); Cerro Morrocoy al Sur y La Serranía Colmena al Norte, 16 Oct. 1977, *Huber 1206* (VEN); cuenca del Río Manapiare, 150 m, 15 Aug. 1978, *Huber 2239* (US); alto Río Ventuari, sabana del Oso, 17 Aug. 1978, *Huber 2280* (US); sabanas de Rincones de Chacorro, 5 km NE de Galipero, ca. 80 m, 17 Aug. 1979, *Huber 4179* (US, VDB, VEN); sabanas de Santa Barbara, 19 July 1980 (VEN); ca. 30 km N of Puerto Ayacucho, *Kral et al. 70732* (NY, US, VDB, VEN); Puerto Ayacucho, S side, 22 Nov. 1984, *Kral & Boom 71781* (NY, VDB, VEN); Esmeralda Savanna, ca. Aug. 1928–Apr. 1929, *Tate 265* (F, NY). APURE: Estero la Yaguita, 23 Sep. 1979, *Garofalo 378* (US); Alto Apure, Gonzalez, Mar. 1975 (U, VEN); alrededores de Puerto Paez, sabana, 19 Mar. 1973, *Ramia & Montes 5159* (US); sabanas de El Rosero, July 1976, *Tejos s.n.* (US). BOLÍVAR: vic. Panare, 6 km from Maniapure toward Caicara, *Boom & Grillo 6290* (NY, VDB); alrededores de Puerto Nuevo, 14 Nov. 1982, *Guánchez & Huber 2469* (TFAV, VDB); 2 km S of Ciudad Piar, 300 m, 18 Oct. 1953, *Maguire et al. 35834* (GH, NY, US); 14 km SW of Caicara del Orinoco, 2 Sep. 1985, *Steyermark et al. 131112* (MO, VDB, VEN); E of Río Parguaza, 125 km N of Alcabala of Puerto Ayacucho, 8–11 Sep. 1985, *Steyermark et al. 131752* (MO, VDB, VEN); morichal just N of Río Chiguirete, 420 m, 11 Oct. 1954, *Wurdack & Guppy 20* (NY, US); 2 km E of Río Orinoco between Río Horeda and Cerro Gavilan, 17 Dec. 1955, *Wurdack & Monachino 39951* (NY, US). GUÁRICO: Parque Nacional Aguaro-Guáriquito: Morichal Charcote, Dec. 1981, *Delascio et al. 11152* (MO, VDB, VEN).

This common plant of low- to medium-elevation savanna bears a considerable resemblance to *X. tortula* C. Martius of the planalto of Brazil and may indeed intergrade with it. I have seen the phototype of *X. fallax*, the type supposedly still at M, and am surprised to see that it is comprised of two good specimens of *X. lacerata*.

71. Xyris oblata Kral & Lyman B. Smith, sp. nov. TYPE: Venezuela. T. F. Amazonas: en la sombrede arboles pequenos; fls. amarillas; en las sabanetas periodicamente enegadas cerca de la margem del Caño Temi, Yavita, 128 m, 31 Jan. 1942, *Llewelyn Williams 14121* (holotype, F; isotypes, F, US). Figure 71.

Planta solitaria vel caespitosa, tenuis, annua aut perennis, 3–4 dm alta, caulibus contractis. Folia principalia vulgo flabellate expansa, 1–2 dm longa; vaginae brunneociliatae, laminas ca. 2-plo breviora, brunneolae vel atroporphyreae, sursum in laminas gradatim contractae, eligulatae; laminae gladiatolineares, complanatae, 1–3.5 mm latae, a medio ad apicem gradatim contractae, ad apicem abrupte incurvatae vel erectae, acutae, leviter incrassatae; margines tenues, scabriduli; paginae leviter stratonervosae, marroninae, dense scabrido-rugosae. Vaginae scaporum foliis breviora, proxime contortae, carinatae et costatae, carinatis scabridis, ad apicem apertae, laminis curtis, ciliatis, erectis. Scapi recti vel flexuosi, torti, ad apicem teretes vel in sectione transversali ovales, papillati, ecostati, plani vel leviter striati. Spicae oblatae, ca. 5 mm altae, 6–7 mm latae, interdum proliferatae, brunneolae, bracteis numerosis integris, spiraliter imbricatis, area dorsalis distinctis; bracteae steriles plures, fertilibus leviter breviores et angustiores, fertiles gradatim profluentes; bracteae fertiles late obovatae, ca. 5 mm longae, subintegrae, ecarinatae, leviter convexae; area dorsalis ovata vel elliptica, pallide punctata. Sepala lateralia libera, inaequilatera, ca. 4 mm longa, obtusa, pallide spadiceae; ala carinali valde curvata, a medio ad apicem fimbriatolacerata. Lamina petalorum obovata, ca. 4.5 mm longa (est.), luteola. Staminodia bibrachiata, brachiis dense longipenicillatis. Antherae lanceolatae, 1.5 mm longae; filiis ca. 0.5 mm longis. Capsula ellipsoidea vel subrotunda, ca. 2.5 mm longa, planoconvexa, placentae axiales. Semina numerosa, ellipsoidea, ca. 0.8 mm longa, atrosuccinea, longitudine valde et anguste 28–30-costatae.

Solitary or cespitose, slender annual or short-lived perennial 3–4 dm high, the stems contracted. Leaves mostly spreading flabellately, 1–2 dm long; sheaths soft, ca. ½ as long as blades, carinate, brown ciliate, dull brown to deep red-brown, rugoscabrid, narrowed gradually to blades and eligulate; blades gladiate-linear, flat, 1–3.5 mm wide, tapering gradually from midblade to an erect or slightly incurved, bluntly acute, slightly thickened tip; margins thin, scabridulous; surfaces striate-ribbed, maroon, densely scabridulous-rugose. Scape sheath shorter than leaves, proximally twisted, carinate and costate, the keel scabrid, open at apex, with short, ciliate, erect blade. Scape straight or flexuous, twisted, distally terete or oval in cross section, papillate, ecostate, level or striate. Spikes depressed-globose, ca. 5 mm long, 6–7 mm broad, sometimes proliferous, dull brown, of many firm, entire, spirally imbricate bracts with distinct dorsal areas; sterile bracts several, the lowest narrower and slightly shorter than the fertile bracts, scabrid-ciliate, grading into fertile bracts; these obovate, ca. 5 mm long, broadly rounded, subentire, the backs shallowly convex, ecarinate, papillate, the dorsal area oval to elliptic, pale punctate. Lateral sepals free, inequilateral, ca. 4 mm long, obtuse, tan, the thin, strongly curvate keel fimbriolacerate from middle to apex. Petal blades obovate, ca. 4.5 mm long (estimate), yellow. Staminodia bibrachiate, the branches densely long-

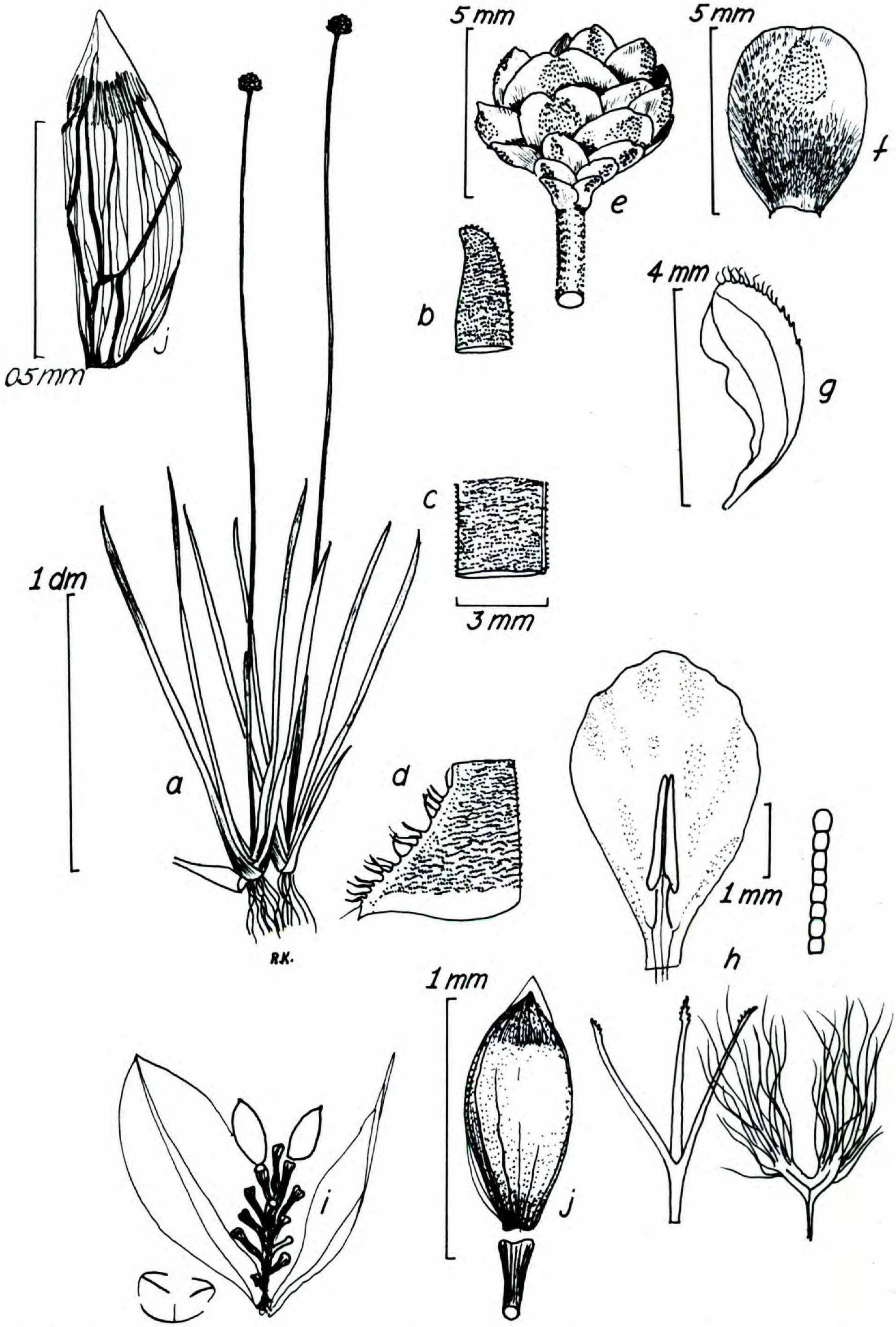


FIGURE 71. Xyris oblata *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf at midblade.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen, staminode, beard hair, stylar apex.—i. Dehisced capsule, showing placentae, two valves, oblique view showing septum.—j. Bottom center, seed on funicle; upper left, detail.*

penicillate. Anthers lanceolate, ca. 1.5 mm long, planoconvex, the placentation axile at base. Seeds ellipsoid, ca. 0.8 mm long, dark amber, with 28–30 strong, narrow, irregular longitudinal ribs.

Distribution. So far known only from the type collection.

Material of this distinctive species in general character of leaves and aspect of plant much resembles some *X. savanensis*. It differs markedly in that the leaf sheaths are conspicuously ciliate, the spikes distinctively oblate, and the ornamentation of lateral sepals different. Also, the staminodial branches are densely long-penicillate, a character lacking in *X. savanensis*.

72. Xyris tenella Kunth, Enum. Pl. 4: 9. 1843. TYPE: Brazil. São Paulo: Sul do Estado, *Sellow s.n.* (lectotype, B; phototype, US). Figure 72.

Synonyms given below are only for Venezuelan material.

Xyris steyermarkii Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 30, fig. 15A–E. 1963. TYPE: Venezuela. Bolívar: Caño Mojado between base of upper falls and drop to escarpment, 1,985–1,910 m, summit, Chimantá Massif, Torono-tepui, 23 Feb. 1955, *J. A. Steyermark & J. J. Wurdack 1096* (holotype, NY; isotype, US).

Xyris yutajensis Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 36, fig. 19A–F. 1963. TYPE: Venezuela. T. F. Amazonas: small savanna and along left fork of Caño Yutaje, 1,250 m, Serranía Yutaje, Río Manapiare, 12 Feb. 1953, *B. Maguire & C. K. Maguire 35206* (holotype, NY; isotype, US).

Cespitose, delicate, low smooth annual, 0.5–2 dm high, the stems contracted. Leaves mostly erect, 2–8 cm long; sheaths soft, scarious, long-ciliate, stramineous or pale brown, less than ½ blade length, finely costate, evenly narrowed from dilated base to blade, eligulate; blades linear-filiform, slightly twisted, somewhat flattened, ca. 0.5 mm wide, narrowed at apex to an incurved-apiculate, callused tip; margins entire, smooth, or ciliolate; surfaces very finely nerved, green to maroon. Scape sheaths shorter than leaves, at base tubular, multicostate, brown, distally open and slightly dilated, keeled, with short, erect blades. Scapes filiform, terete, 0.3–0.4 mm thick, finely striate distally, sometimes unicostate with a low costa, or low-costate, costae papillate to finely scabrid. Spikes ellipsoid or lance-ovoid, drying narrowly obovoid, ca. 5–6 mm long, of a few thin, brown to tan bracts with prominent but narrow or streaklike dorsal areas; sterile bracts few, lance-ovate or oblong, navicular, smaller than the fertile bracts, grading into them; fertile bracts few, lanceolate, rounded-folded (navicular), ca. 5–5.5 mm long, acute, subentire or lacerate, the keel darker brown. Petal blades broadly obovate, 3 mm long, yellow, the broadly or narrowly rounded apex with sinuate-erose margin. Staminodia lacking or blade broadly bilobed, beardless (in the Guayanas). Anthers lance-oblong, ca. 1 mm long, deeply bifid and sagittate, on broad filaments 0.6–0.7 mm long. Capsule narrowly ovoid, ca. 3 mm long, acuminate, the placentation basal. Seeds ovoid to ellipsoid, ca. 0.5 mm long, deep amber, finely lined longitudinally.

Distribution. Low- to high-elevation savanna from southeastern Venezuela eastward to French Guiana; southward through the planalto of Brazil, thence south into Paraguay.

Selected specimens examined. Citations are selected from Venezuelan material only. VENEZUELA. T. F. AMAZONAS: below Salto Los Monos on trib. headwaters of Río Iguapo, 1,500–1,600 m, 11 Mar. 1985, *Liesner 18534* (MO, VDB); Cerro de Marahuaca, Río Yameduaka, 19 Feb. 1985, *Liesner 17711* (MO, VDB); Cerro Marahuaca, la meseta Sur-Este, 1,560 m, 13–14 Oct. 1983, *Steyermark 129599* (VDB, VEN). BOLÍVAR: Auyan-tepui, ca. 1,900 m, Apr. 1956, *Foldats 2642* (VEN); Cerro El Venado, ca. 20 km E de Canaima, *Huber et al. 8257* (NY); Auyan-tepui, sector SSE, 10 Dec. 1983, *Huber & Medina 8522*; Serranía Guanay, sect. nor-oriental, 20–28 Oct. 1985, *Huber 10966* (MYF, VDB, VEN); La Escalera, ca. 1,200 m, 22 July 1983, *Kral 70308* (VDB, VEN); top of La Escalera, ca. 1,200 m, 24 July 1983, *Kral 70327* (F, K, MO, NY, U, US, VDB, VEN); just S of La Escalera ca. 1,200 m, 24 July 1983, *Kral 70372* (VDB, VEN); 6.5 km N of Pioneer Monument by Ven. 10, ca. 1,200 m, 24 July 1983, *Kral 70396* (US, VDB, VEN); Salto Yuruaní, 1,000 m, 29 July 1983, *Kral 70614* (VDB, VEN); Auyantepui, *Panier & Schwabe 5/9* (VEN); Chimantá Massif, middle falls below Summit Camp, 1,925 m, 5 Feb. 1955, *Steyermark & Wurdack 468* (NY, US); between Luepa and Cerro Venamo, 1,300 m, 25 Apr. 1960, *Steyermark & Nilsson 770* (NY, US); Chimantá Massif, Torono-tepui, summit,

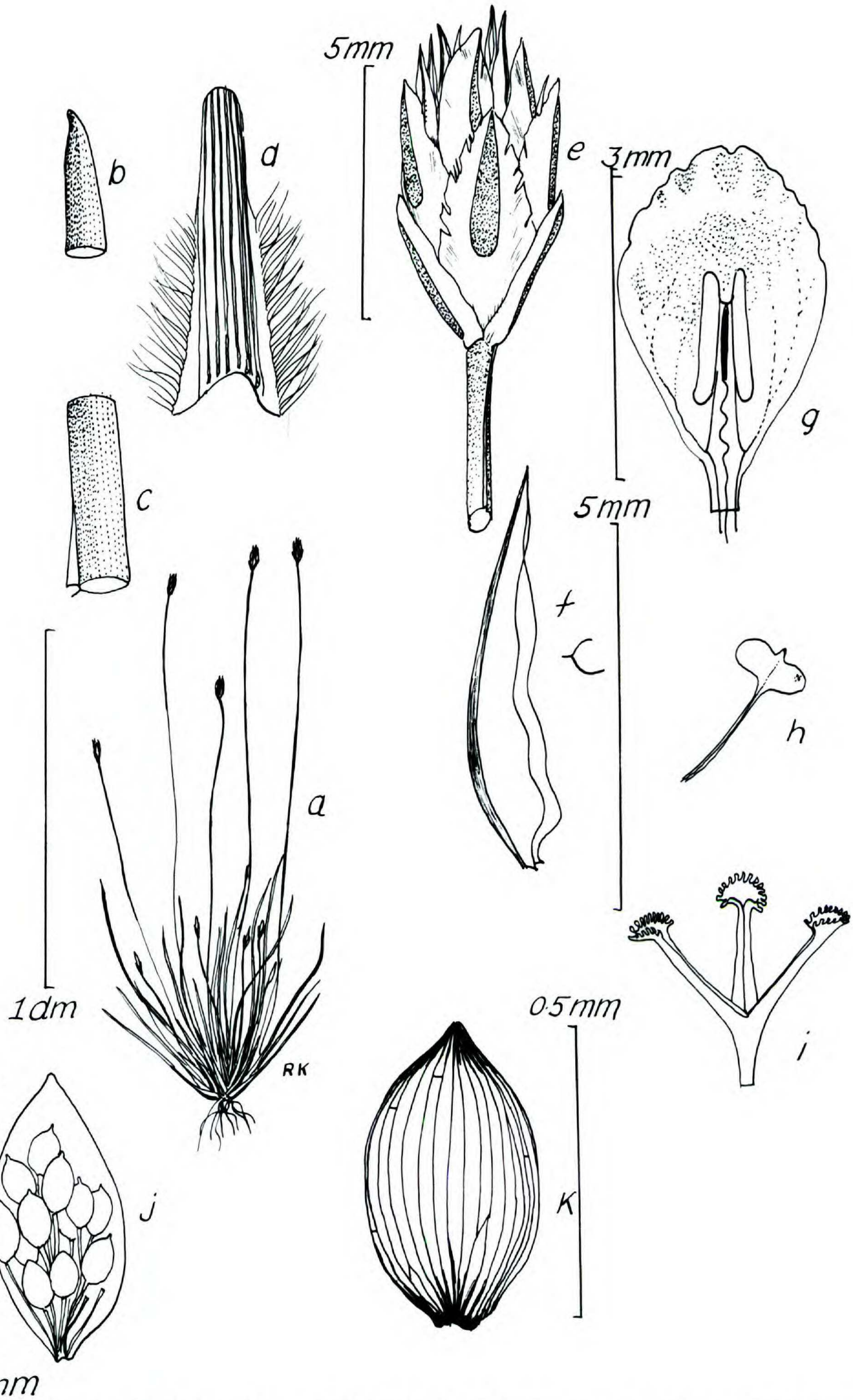


FIGURE 72. Xyris tenella *(*Kral 70372*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule, two valves removed, showing basal placentation.—k. Seed.*

Feb. 1955, *Steyermark & Wurdack 1096* (Type of *X. steyermarkii*, F, NY, US, VDB, VEN); Chimantá Massif, Torono-tepui South Caño, summit, 1,955 m, 23 Feb. 1955, *Steyermark & Wurdack 1122* (F, NY, US); Ptaritepui, entre "Drizzly Camp" y "Second Wall," 1,660–1,800 m, 11 May 1964, *Steyermark 93698* (F, MAC, NY, US, VDB, VEN); Meseta de Jaua, Cerro Jaua, 22–27 Mar. 1967, *Steyermark 97904* (F, K, NY, U, US, VDB); cumbre del Cerro Guaiquinima, sector suroeste-central, 26 May 1978, *Steyermark et al. 117480*; Cerro Marutani, 1,200 m, 2 Jan. 1981, *Steyermark 123895* (NY, US, VDB); parte superior del plato de Auyantepui, 2,300 m, Apr. 1956, *Vareschi & Foldats 4958* (NY, VEN).

Some insight into the *X. tenella* situation was given me by examination of a *Tate* specimen (*810*) from the gorge of Caño Negro, Savanna Hills, Mt. Duida. Malme, working when that part of Venezuela was hardly explored, did see this specimen, annotating it at first *X. tenella* Kunth var. *subtenella*, a taxon he later (Ark. Bot. 13(3): 44. 1913) changed to a form of the type variety. This led me to examine a rather large series of materials from Brazil and Paraguay. From these it appears that if transplants of *X. tenella* from Paraná or Mato Grosso were put in suitable habitat in Venezuela, such would be indistinguishable from forms named *X. steyermarkii* and *X. yutajensis*. The variety from French Guiana (var. *leprieurii* Malme, "Cajenne legit Le Prieur" isolectotype at L) is taller than the Venezuelan material, has flat, ciliolate-edged leaf blades, and narrowly ovoid spikes.

The dorsal area character in this species varies troublesomely. Sometimes it appears only on some bracts. In Brazil are specimens named other species that, if given the pencil-thin dorsal area, would again be placeable in *X. tenella*. The only constant, apart from the low and annual or short-lived perennial habit, seems to be the long brush of ciliae on the leaf-sheath edges. The dorsal area when present is very narrow, a ready means of distinguishing this from extremes of *X. guianensis*, which always has a broad dorsal area.

73. Xyris byssacea Kral, sp. nov. TYPE: Venezuela. T. F. Amazonas: Dpto. Río Negro, Valle de Titirico N of Pico Phelps in Cerro Neblina, ca. 0°56′N, 65°58′W, ca. 2,200 m; peat bog interspersed with shrub and low rocky but wet ridges, flowers opening in the A.M., 1 Dec. 1984, *R. Kral et al. 71926* (holotype, VEN; isotypes, MO, NY, US, VDB). Figure 73.

Planta perennis, densicaespitosa, glabra, delicatula. Caules breves; radices graciles. Folia principalia arcte disticha, suberecta, 8–15 cm longa, vaginis scaporum longiora; vaginae elongatae, laminis multi-plo longiores, byssaceociliatae, pallide brunneolae, nitidae, ad basin gradatim dilatatae, in laminas gradatim decrescentes, eligulatae; laminae compressae, 0.3–0.4 mm latae, leviter tortae, ferrugineae, nitidae, subcapillaceae, in apicem gradatim decrescentes, ad apicem conico-subulatae, plerumque setaceae. Scapi tenues, 20–30 cm longi, brunnei, apicem versus teretes, ecostati vel leviter striati, ca. 0.5 mm crassi. Spicae pauciflorae, ellipsoideae, tum curto-cylindricae, pallide brunneolae, ca. 6 mm longae; bracteae leviter expanse, integrae, decussatae, area dorsali lineare, infimae 4 steriles, par inferiora lanceolata, ca. 3–4 mm longa, acuta, valde carinata, par intima ovata, ca. 4 mm longa, ad apicem curto-carinata, area dorsali redacto; bracteae fertiles 2–4, oblongae, 4.5–5 mm longae, subconduplicatae, anguste rotundatae, a medio ad apicem carinatae, area dorsali lineari. Sepala lateralia libera, inaequilateralia, anguste-elliptica, ca. 4.5–5 mm longa, acuta, leviter curvata, ala carinali angusta sed crassa, integra. Laminae petalorum anguste obovatae, luteolae, ca. 4 mm longae, integrae. Staminodia bibrachiata, brachiis anguste triangulatis, longipenicillatis. Antherae lanceolatae, vadose bifidae et sagittatae, ca. 1.5 mm longae, filiis ca. 0.5 mm longis. Capsula matura anguste ellipsoidea, ca. 3 mm longa; placenta basalis, funiculis elongatis. Semina ellipsoidea vel cylindrica, ca. 1 mm longa, translucentia, pallide ferrugineobrunneola, subtiliter longitudine spiraliter lineata.

Densely cespitose, smooth, delicate perennial. Stems short; roots slender. Principal leaves tightly distichous, suberect, 8–15 cm long, longer than the scape sheaths; sheaths elongate, many times longer than the blades, cobwebby-ciliate, pale brown, shining, gradually dilated toward base, gradually narrowing into blades, eligulate; blades flattened, subcapillary, 0.3–0.4 mm wide, slightly twisted, entire, red-brown, lustrous, gradually tapering, conic-subulate at apex, often setaceous. Scapes slender, 20–30 cm long, brown, terete toward apex, ecostate to slightly striate, ca. 0.5 mm thick. Spikes few-flowered, ellipsoid, later short-cylindric, pale brown, ca. 6 mm long; bracts spreading slightly, decussate, entire, the dorsal areas linear, the lowest 4 bracts sterile, the lowest pair lanceolate, ca. 3–4 mm long, acute, strongly carinate, the inner pair ovate, ca. 4 mm long, with a short carina

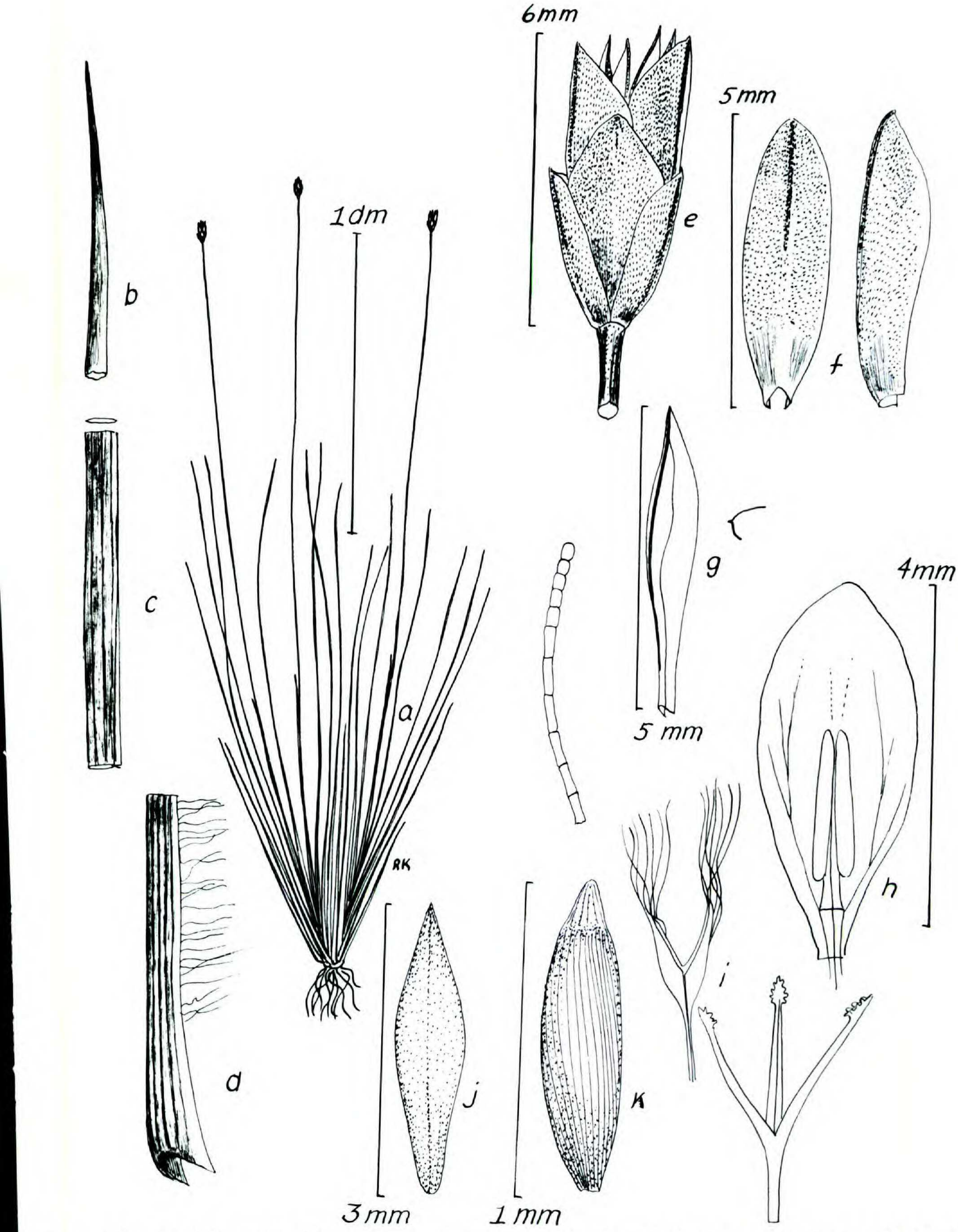


FIGURE 73. Xyris byssacea *(from an isotype)*.—*a. Habit sketch.—b. Leaf apex.—c. Sector of leaf at blade–sheath junction.—d. Leaf base.—e. Spike.—f. Two views of fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, stylar apex.—j. Capsule.—k. Seed.*

at apex, the dorsal area reduced; fertile bracts 2–4, oblong, 4.5–5 mm long, subconduplicate, narrowly rounded, carinate from middle to apex, the dorsal area linear. Lateral sepals free, inequilateral, narrowly elliptic, ca. 4.5–5 mm long, acute, slightly curvate, the carinal keel narrow but thick, entire. Petal blades narrowly obovate, yellow, ca. 4 mm long, entire. Staminodia bibrachiate, the branches narrowly triangular, long-penicillate. Anthers

lanceolate, shallowly bifid and sagittate, ca. 1.5 mm long, on filaments ca. 0.5 mm long. Capsule narrowly ellipsoid, ca. 3 mm long; placenta basal, the funicles elongate. Seeds ellipsoid to cylindric, ca. 1 mm long, translucent, pale red-brown, finely spirally lined longitudinally.

Distribution. Known only from the type area.

This species combines the slender habit of *X. delicatula* and *X. carinata* with the smooth, glassy-scaped character of *X. setigera*; yet the foliage is utterly smooth and the filiform, evenly tapering leaf blades entire. Notable are the spreading arachnoid-ciliate hairs of the sheath margins.

74. Xyris cryptantha Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 16, fig. 2A–E. 1963. TYPE: Venezuela. T. F. Amazonas: Ríos Pacimoni–Yatua–Casiquiare, fls. yellow, locally frequent, Sabana Pacimoni on rt. bank of Río Pacimoni, above mouth 50 km, 100 m, 2 Oct. 1957, *B. Maguire, J. J. Wurdack & C. K. Maguire 41677* (holotype, NY; isotypes, US, NY, VEN). Figure 74.

Mostly low, slender, tufted, fibrillose-based and short-lived perennial or annual 0.6–2.5 dm high, the stems contracted. Leaves erect, 0.5–2 dm long; sheaths floccose-ciliate or pilose-ciliate, less than ½ as long as blades, dilated at very base, broad, castaneous, tapering abruptly, then gradually to blades, eligulate, the blades filiform, subterete or slightly compressed but not sharp-edged, 0.7–1 mm thick, smooth and pale-puncticulate, conic-subulate or incurved-conic at apex. Scape sheaths much shorter than leaves, loosely tubular, with short, erect blades. Scapes linear-filiform, straight or flexuous, slightly twisted, smooth, maroon, pale-puncticulate (stomata), ca. 0.5 mm thick, distally terete, ecostate. Spikes obovoid, 5–9 mm long, reddish brown, few-flowered, the bracts distichous and loose, with large, distinct, pale brown dorsal areas, the sterile bracts ca. 4, the lowest pair distinctly longer than the fertile bracts, narrowly oblong-pandurate, with carinate, cucullate, acute tips arching over spike tip, often there connivent; fertile bracts oblong, 5.5–6 mm long, navicular, erect, the margins entire, scarious, lacerate, the tips rounded. Lateral sepals free, subequilateral, lance-linear, ca. 5.5 mm long, narrowly acute to acuminate, lustrous red-brown, the narrow, firm keel lacerate or friable-fimbriate above middle, later distantly ciliolate. Petal blades broadly obovate, ca. 5.5 mm long, yellow, the broadly rounded apex erose. Staminodia bibrachiate, the branches densely long-penicillate. Anthers ca. 1.5 mm long, deeply bifid at apex, auriculate at base, on filaments 1 mm long. Capsule narrowly ellipsoid-cylindric, 2.5–3 mm long, trilocular, the placentation thus axile, appearing free-central as valves detach. Seeds numerous on short funicles, ovoid or ellipsoid, ca. 0.5 mm long, pale red-brown, apiculate, longitudinally prominently but finely ribbed.

Distribution. Low, sandy savanna, locally abundant, southeastern Colombia, Territorio Federal Amazonas in Venezuela, and a disjunction in the Serra Araca, Amazonas, Brazil.

Additional specimens examined. BRAZIL. AMAZONAS: plateau of northern massif of Serra Aracá, 0°51–57′N, 63°21–22′W, 1,200 m, S side of North Mt., open plateau savanna, 11 Feb. 1984, *G. T. Prance et al. 28981* (INPA, NY). COLOMBIA. AMAZONAS: Puerto Huesito, sabanas del Alto de La Cruz; entre el Caño Chaquita (afluente del Atabapo) y en Caño Gente, 18–20 Aug. 1975, *H. García-Barriga 20890* (GH, US, VDB). VENEZUELA. T. F. AMAZONAS: la margen izquierda del Río Sipapo a unos 4–6 km aguas abajo de la boca del Río Guayapo, 8 Oct. 1983, *Guánchez & Varadarajan 2524, 2570* (TFAV, VDB); caño "Cabeza de Manteco" a 3–4 km de la boca, 100 m, al norte del medio Río Autana, 12 Nov. 1984, *Guánchez & Melgueiro 3543* (TFAV, VDB); sabanas en los alrededores de Guarinuma, 95 m, 25 Aug. 1978, *Huber 2656* (US, VDB); 2 km al W de San Antonio del Orinoco, 120 m, 20 July 1980, *Huber & Tillett 5423* (VDB, VEN); 5 km al S de la Laguna Yagua, 22 July 1980, *Huber & Tillett 5475* (VDB, VEN); ribera izquierda (Sur) bajo Río Siapa, poco distante de su desembocadura en el Río Casiquiare, 125 m, 7 Feb. 1981, *Huber & Medina 5799* (VDB, VEN); Sabana Pacimoni on rt. bank of Río Pacimoni, 50 km above mouth, 2 Oct. 1957, *Maguire & Wurdack 41667* (NY, US); Sabana El Venado on left bank of Caño Pimichín above Pimichín, 2 July 1959, *Wurdack & Adderley 43294* (NY, U, US, VEN).

This distinctive xyrid, in its low habit, slender foliage, small seeds, and general bract

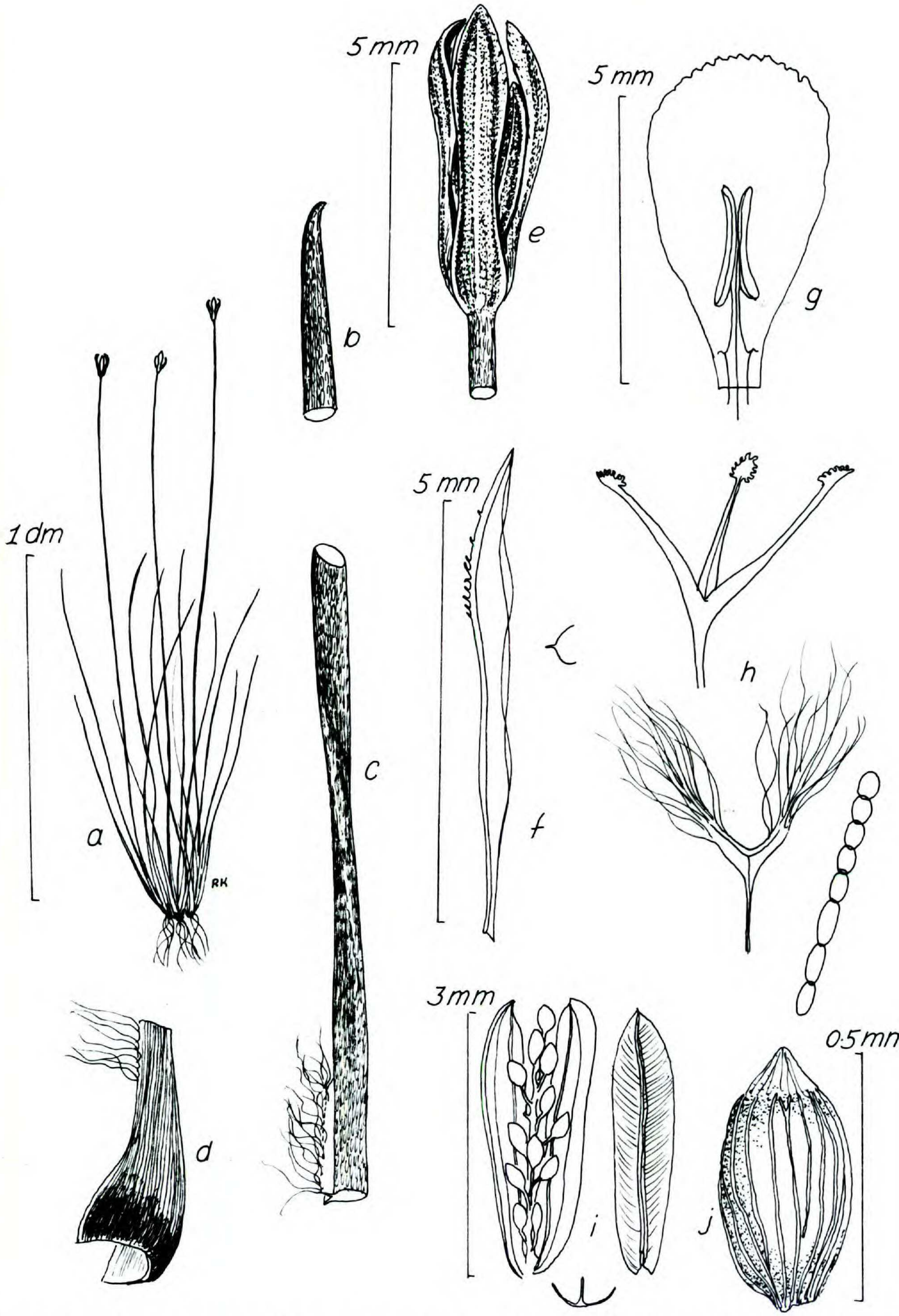


FIGURE 74. Xyris cryptantha *(*Huber & Tillett 5475*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Stylar apex, staminode.—i. Capsule; at left with one valve removed; a valve at right.—j. Seed.*

characters definitely lies near *X. oxylepis*, a species with which it is associated in the white-sand savannas.

75. Xyris oxylepis Idrobo & Lyman B. Smith, Caldasia 6(29): 204, fig. 7a–c. 1954. TYPE: Colombia. Vaupés: "Río Kuduyari, cerro Yapoboda, sabanas sobre piedras areniscas," ca. 450 m, 5 Oct. 1951, *R. E. Schultes & I. Cabrera 14234-B* (holotype, COL; isotype, US). Figure 75A, B.

Xyris fusiformis Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 24, fig. 8A–E. 1963. TYPE: Venezuela. T. F. Amazonas: Sabana El Venado on left bank of Caño Pimichín, above Pimichín, 140 m, 10 Oct. 1957, Río Guainía, *B. Maguire et al. 41815* (holotype, NY; isotypes, GH, US).

Slender, low, wiry, cespitose perennial, the bases cloaked in fibrillose-chaffy remnants of old leaves, the stems contracted, the plants 1–3 dm high. Leaves mostly erect, quill-like, sometimes exceeding the scapes; sheaths less than ½ as long as blades, at base dull brown to castaneous, dilated, above brownish or red-brown, the edges villous-ciliate with brown hairs below, tapering gradually to blades and white-cottony-ciliate above, at junction with blade producing a broad, blunt ligule or essentially eligulate; blades subterete, usually with 4 or more rounded ribs and shallow sulci, sometimes with a strong ventral sulcus, narrowly linear, 0.5–0.7(–1) mm thick, apically conic-acute or narrowly triangular, smooth, the surfaces smooth or papillate, often white puncticulate. Scape sheaths much shorter than leaves, tubular and multicostate proximally, distally producing a short blade similar to leaves. Scapes twisted and flexuous, about as broad as leaves, terete distally, smooth, prominently multicostate, the ribs low, white puncticulate. Spikes narrowly ellipsoid or fusiform, aging cylindric, 7–10 mm long, acute, of a few, loosely imbricate, subdecussate, ecarinate bracts with strong dorsal areas; lower 4 bracts sterile, lance-ovate, 5–8 mm long, ½ or more as long as spike, broadly acute or narrowly rounded apically, scarious-edged, with large, elliptic, medially 1-nerved dorsal areas; fertile bracts 2–3, usually slightly longer and often with slightly narrower outline than sterile bracts, ca. 8 mm long, with similar dorsal areas. Lateral sepals free, equilateral, lance-linear to elliptic-linear, 6–7.5 mm long, acute, the narrow, firm keel entire or with scattered cilia above middle. Petal blades obovate, 5–6 mm long, yellow, the broadly or narrowly rounded apex erose or dentate-lacerate. Staminodia bibrachiate, the branches long-penicillate. Anthers oblong, ca. 2–2.5 mm long, nearly ½ bifid, deeply sagittate, on filaments 1.5–2 mm long. Capsule ellipsoid, ca. 3 mm long; valves with strong septa from base to tip, the placentation appearing axile. Seeds short-cylindrical, 0.7–0.8 mm long, pale amber, apiculate, finely anastomosing-ribbed longitudinally.

Distribution. Low-elevation sandy savanna, southeastern Colombia (rare) eastward into southwestern Venezuela, where locally abundant in the Orinoco savannas.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Santa Cruz, margen del Río Atabapo, 4 Sep. 1960, *Foldats 3675* (US); Cerro Yapacana, Savanna III, 3 June 1978, *Huber 2036* (US); sabanas al SE de Carmelitas, 26 Aug. 1978, *Huber 2668* (US); Caño Yagua, 15 km río arriba desde la boca, 6 Dec. 1978, *Huber & Tillett 2906* (US); savanna III, 20–25 km al W de San Juan de Manapiare, *Huber 4588* (US); Estación de Piscicultura de Puerto Ayacucho, 75 m, *Maas & Huber 5164* (U, VDB); 30 km al N de Puerto Ayacucho, 5 km al NE de Galipero, 80 m, *Huber 5746* (US); same locality, 7 Nov. 1979, *Huber 4695* (US, VDB); 1 km N de la Laguna Yagua, 27 July 1980, *Huber & Tillett 5574* (US, VDB, VEN); 5 km NE de Galipero, 4 Nov. 1980, *Huber 5746* (US); Savanna I, W base Cerro Yapacana, 9 Aug. 1983, *Kral & Huber 70691* (F, K, L, MO, NY, SP, TFAV, US, VDB, VEN, and others); savannas II and III, 10 Aug. 1983, *Kral & Huber 70711* (US, NY, VDB, VEN); left bank of Caño Pimichín above Pimichín, 140 m, 23 Nov. 1953, *Maguire & Wurdack 36356* (NY, US); Yapacana savannas, 16 Sep. 1957, *Maguire et al. 41538* (NY, US); Cerro Yapacana, base, 8–9 Nov. 1979, *Thomas & Rogers 2590a* (NY).

The overlap of this Colombian rarity with the Venezuelan ecological and morphological equivalent, *X. fusiformis*, necessitates their combination even though ripe seeds are undescribed from Colombian material. In the savannas along the upper Orinoco it is a common sight, its pale yellow flowers unfolding in the afternoon. To illustrate reason for the

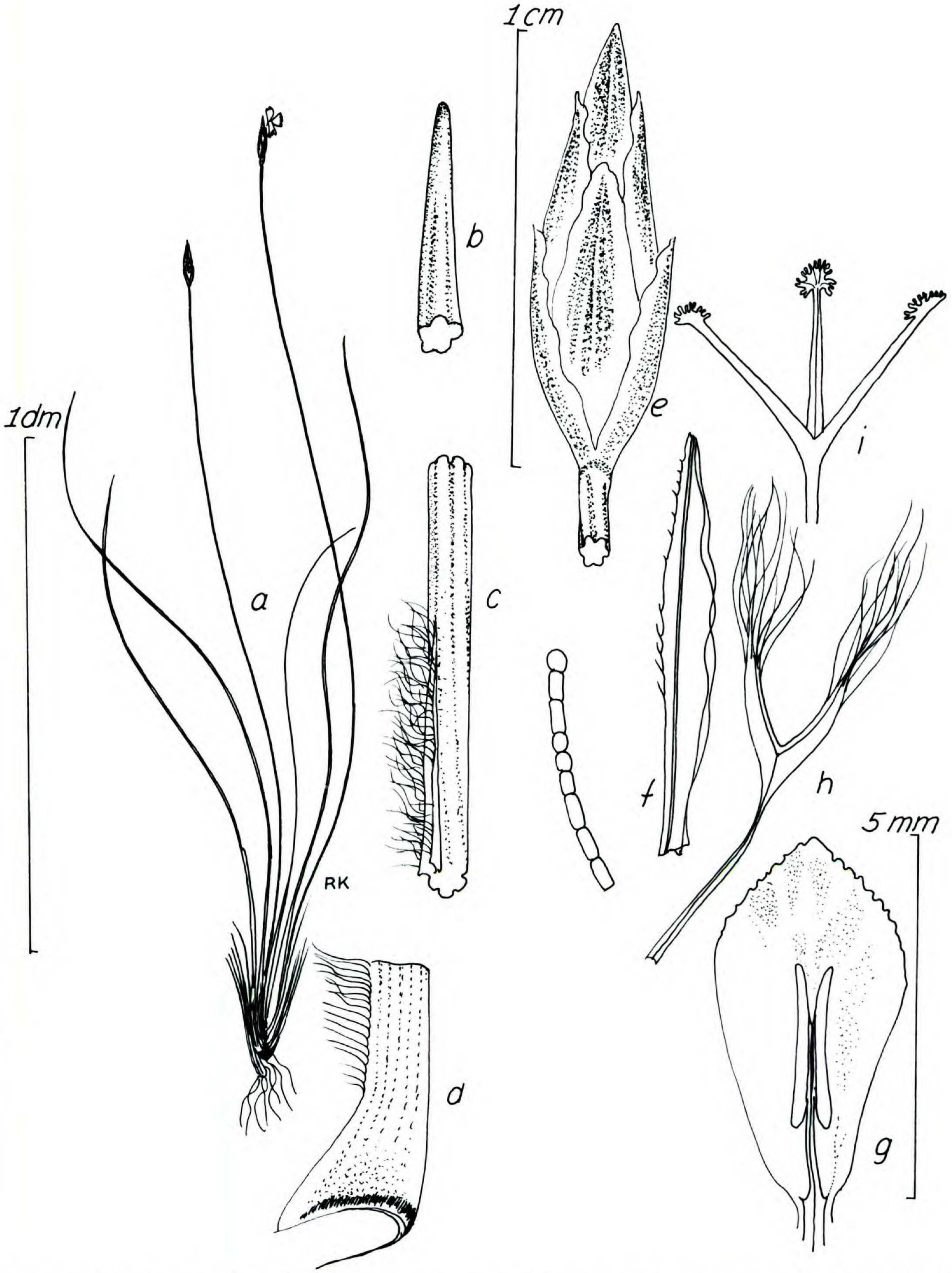


FIGURE 75A. Xyris oxylepis *(from the isotype)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.*

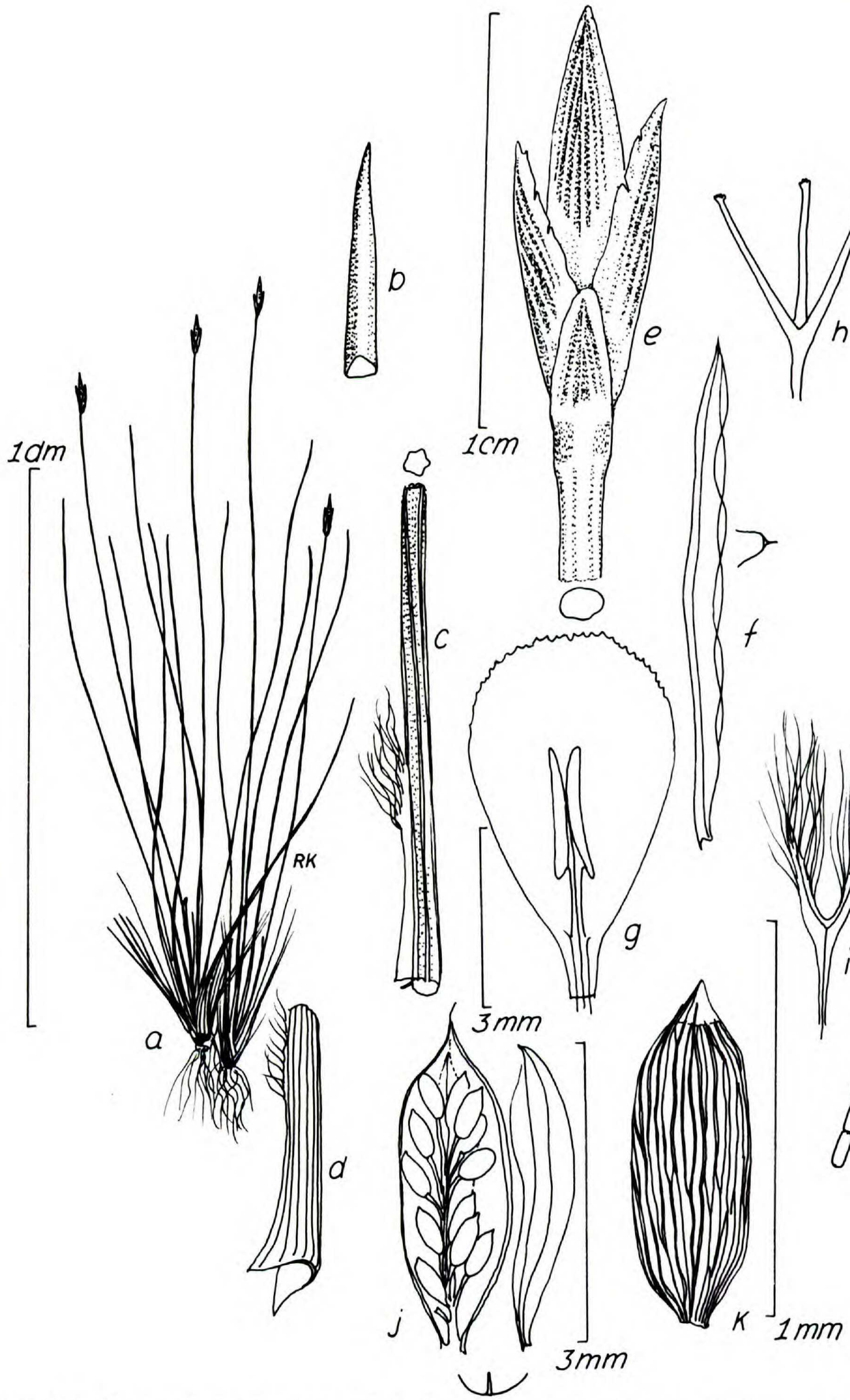


FIGURE 75B. Xyris oxylepis *(from type of* X. fusiformis *and from* Kral & Huber 70691*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal, stamen.—h. Stylar apex.—i. Staminode.—j. Capsule; at left with valve removed; at right a valve showing the septum.—k. Seed.*

combination of Colombian and Venezuelan material, Figures 75A (from the type of *X. oxylepis*) and 75B (from material of *X. fusiformis*) are presented.

76. Xyris wurdackii Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 24–25, fig. 9A–E. 1963. TYPE: Venezuela. T. F. Amazonas: Yavita–Pimichín trail near Pimichín, 140 m, Río Guainía, 22 Nov. 1953, *B. Maguire, J. J. Wurdack & G. S. Bunting 36366A* (holotype, NY; isotype, US). Figure 76A.

KEY TO THE SUBSPECIES OF *XYRIS WURDACKII*

1a. Most scapes overtopped by principal leaves; leaf blades and scapes prominently white punctic-ulate; fertile bracts pilose-ciliate at tips ..... 76A. *X. wurdackii* subsp. *wurdackii*

1b. Most scapes overtopping principal leaves; leaf blades and scapes not noticeably white punc-ticulate; fertile bracts completely smooth ..... 76B. *X. wurdackii* subsp. *caquetensis*

76A. Xyris wurdackii subsp. **wurdackii.**

Cespitose or solitary, perennial, sub-bulbous and fibrillose at base, the stems contracted. Leaves erect or ascending, few, the larger ones 1–3 dm long, twisted and flexuous, mostly overtopping scapes; sheaths less than ⅓ as long as blades, dilated at very base, dark brown or castaneous, gradually narrowing above, long-villous-ciliate, at bristly apex narrowing abruptly into blade, producing a broad, short, rounded-tipped ligule; blades linear, smooth, spirally fluted, terete, 1–1.5 mm thick, ventrally deeply sulcate and with numerous spiral lines of punctae, tapering shortly above middle to narrowly conic apices. Scape sheaths very short, mostly hidden in leaf sheaths, short-bladed. Scapes flexuous and twisted, 6–20 cm high, fluted and punctate as in leaf blades, proximally somewhat flattened, distally subterete with several low ridges, ca. as thick as leaf blades. Spikes obovoid, 7–10 mm long, the outer bracts subulate with raised midribs, nearly as long as or as long as the spike, the backs or at least the margins densely villous-tomentose with pale hairs, these often obscuring the bract outlines; bracts slightly widening inward in spike, the lowermost fertile ones the largest, lanceolate, 6–8 mm long, narrowly acute and at upper margins long-villous-pubescent, the convex backs castaneous and with large, lanceolate, pale-punctate dorsal areas, the margins strongly convolute apically. Lateral sepals lance-linear, free, equilateral, ca. 5 mm long, acuminate, the thin keel finely lacerate or flattened-villose toward apex. Petal blades broadly obovate, ca. 5 mm long, yellow, the narrowly rounded apex erose-crenulate. Staminodia bibrachiate, the narrow, flattened branches densely long-penicillate-ciliate. Anthers oblong-linear, ca. 1.5 mm long, on filaments ca. 1–1.5 mm long, deeply bifid, deeply sagittate. Capsule short-cylindric, ca. 3 mm long, the placental zone extending nearly to apex, the narrow valves with strong septa, thus placentation axile. Seeds numerous, ellipsoid, ca. 0.5 mm long, yellow-amber, multiribbed with narrow but distinct, often anastomosing, ridges longitudinally.

Distribution. Low-elevation savannas, southern Territorio Federal Amazonas, Venezuela.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: ca. a 5 km al W del bajo Río Temi, 100 m, 24 Feb. 1979, *Huber 3427* (US); 2–3 km al SE del bajo Río Guasacavi, 10 Mar. 1980, *Huber 5113* (US); 20 km al S del medio Caño Caname, ca. 100 m, 10 Mar. 1980, *Huber 5144* (US, VDB); 20 km al NW de Yavita, en las cabaceras del Caño Pimichín, 120 m, 11 Feb. 1980, *Huber & Medina 5949a* (VEN).

This subspecies appears to be fairly abundant in and around the type locality. It is very distinct in its combination of terete leaves and long, blonde or silvery, bristly and villose indumentum of spikes and edges of leaf sheaths.

76B. Xyris wurdackii subsp. **caquetensis** Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 24–25. 1963. TYPE: Colombia. Amazonas: frequent in scrub savanna, Araracuara, Río Caque-

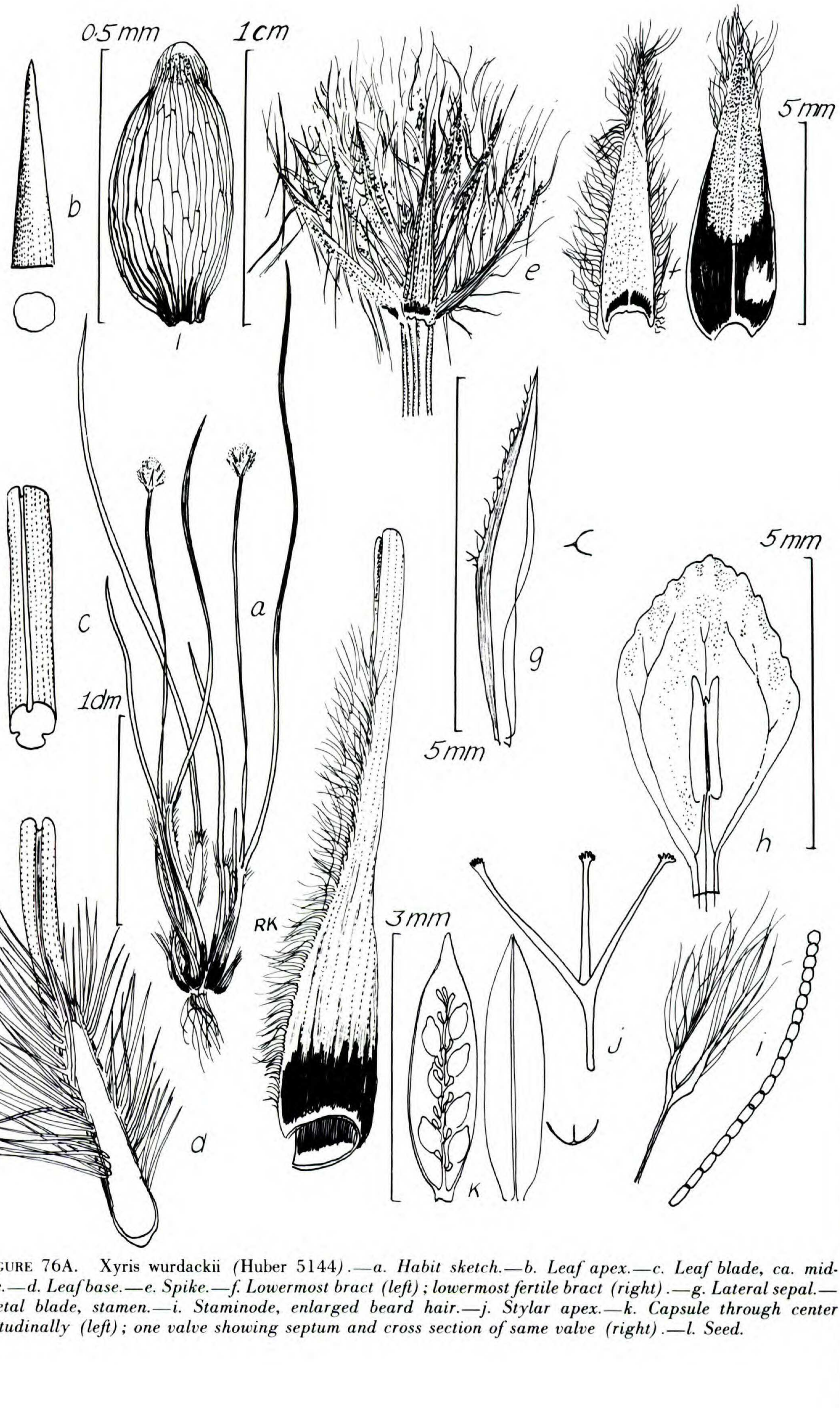


FIGURE 76A. Xyris wurdackii (Huber 5144).—*a. Habit sketch.—b. Leaf apex.—c. Leaf blade, ca. mid-blade.—d. Leaf base.—e. Spike.—f. Lowermost bract (left); lowermost fertile bract (right).—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair.—j. Stylar apex.—k. Capsule through center longitudinally (left); one valve showing septum and cross section of same valve (right).—l. Seed.*

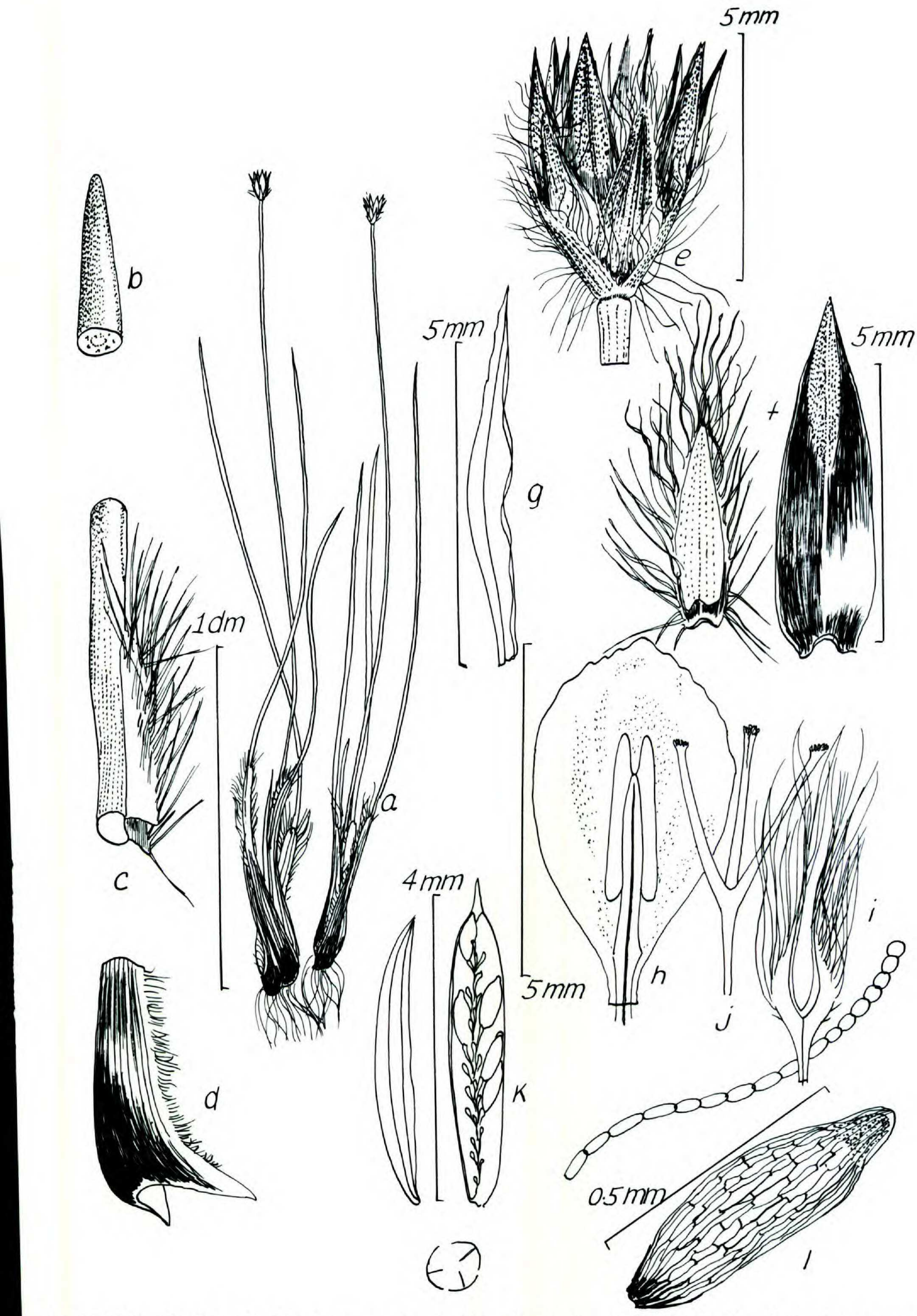


FIGURE 76B. Xyris wurdackii *subsp.* caquetensis *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lowermost bract (left); lowermost fertile bract (right).—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair.—j. Stylar apex.—k. Capsule; median longisection (right), oblique view of valve (left), cross section of fruit without placentae (bottom).—l. Seed.*

ta, 5 Sep. 1959, *B. Maguire, C. K. Maguire & A. Fernandez 44129* (holotype, COL; isotypes, NY, US). Figure 76B.

This subspecies resembles the type subspecies, but most scapes overtop most leaves, and the leaf blades and scapes lack the prominent rows of pale punctae; the lowest sterile bracts are much shorter than spike and shorter than the outer fertile bracts; the inner sterile bracts are progressively less ciliate, becoming totally smooth; and the fertile bracts are entirely smooth. The capsule is narrowly cylindric and ca. 4 mm long; the seeds are slightly narrower and longer (0.5–0.6 mm); and the fine longitudinal ribs are more anastomosing.

Distribution. Known only from the type area.

Paratype. COLOMBIA. AMAZONAS: frequent in Araracuara Savannas, Río Caquetá, *Maguire et al. 44173* (NY).

This is another of the "close" vicariads involving the savannas of southern Colombia and Venezuela.

77. Xyris frequens Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 32–33, fig. 16A–E. 1963. TYPE: Venezuela. T. F. Amazonas: sabanita along Caño Pimichín on right bank 1 km above Pimichín, Río Guainía, 140 m, 24 Nov. 1953, *B. Maguire & J. J. Wurdack 36383* (holotype, NY; isotypes, NY, US). Figure 77.

Firm-based, cespitose perennial 2.5–3.5 dm high, the stems contracted. Leaves erect, the principal ones 1.5–3.5 dm long, the outer ones broad, short, bladeless brown scales; sheaths at intervals villous-ciliate, less than ¼ the length of the blades, pale red-brown, rugulose or nearly smooth, tapering gradually to green, rigid, flexuous or straight, terete or subterete blades 1 mm thick, apically blunt-conic, punctate, tipped (often) with a pale pilose coma, the surfaces smooth distally, proximally rugulose, strongly ribbed or ecostate. Scape sheaths shorter than leaves, open, producing elongate blades similar to leaves. Scapes flexuous and twisted, somewhat compressed, oval in cross section, smooth or finely rugulose. Spikes broadly ellipsoid, drying turbinate, 1–1.4 cm long, bracts several, in several ranks, loosely subdecussate, reddish brown with strong, paler dorsal areas, aging excurvate; sterile bracts several, broadly triangular to ovate, ecarinate, often villous-tufted apically at base, the lowest bracts much smaller than and grading into the fertile bracts, these broadly oblong, rounded-folded, 8–10 mm long, narrowly rounded or acute apically, subentire or erose, when young often villous-ciliate apically and red-bordered, the dorsal areas with a strong midnerve, often with several subparallel laterals. Lateral sepals free, equilateral, lance-linear, ca. 5 mm long, acuminate, the dark, wide, firm keel entire or apically ascending-ciliolate or villous-fimbriolate and coarsely serrate toward base. Petal blades elliptic, ca. 5 mm long, broadly acute and wavy-margined, yellow. Staminodia narrowly bibrachiate, the slender branches penicillate-pilose. Anthers narrowly oblong, 2.5 mm long, deeply bifid, deeply sagittate, on filaments ca. 1 mm long. Capsule ellipsoid-cylindric, ca. 5 mm long, the placentation appearing free-central from base to apex, but each valve detaching with a wide septum, thus placentation actually axile. Seeds numerous on short funiculi, narrowly ellipsoid, 1.5–1.6 mm long, including a pale, conic apiculus, the body finely striate, pale brown, overlain by a coarse, irregularly anastomosing reticulum of dark brown ridges.

Distribution. So far known only from savannas along the Caño Pimichín and those below Cerro Yapacana, Territorio Federal Amazonas, Venezuela. Other than the type, the only records appear to be the following.

Additional specimens examined. VENEZUELA. T. F. AMAZONAS: Savanna III, NW base of Cerro Yapacana, 150 m, 17 Mar. 1953, *B. Maguire & J. J. Wurdack 34572* (NY); Savanna III, Yapacana savannas, 10 Aug. 1983, *Kral & Huber 70706* (MO, NY, US, VDB, VEN).

This species most resembles the more widespread *X. surinamensis* but tends to have

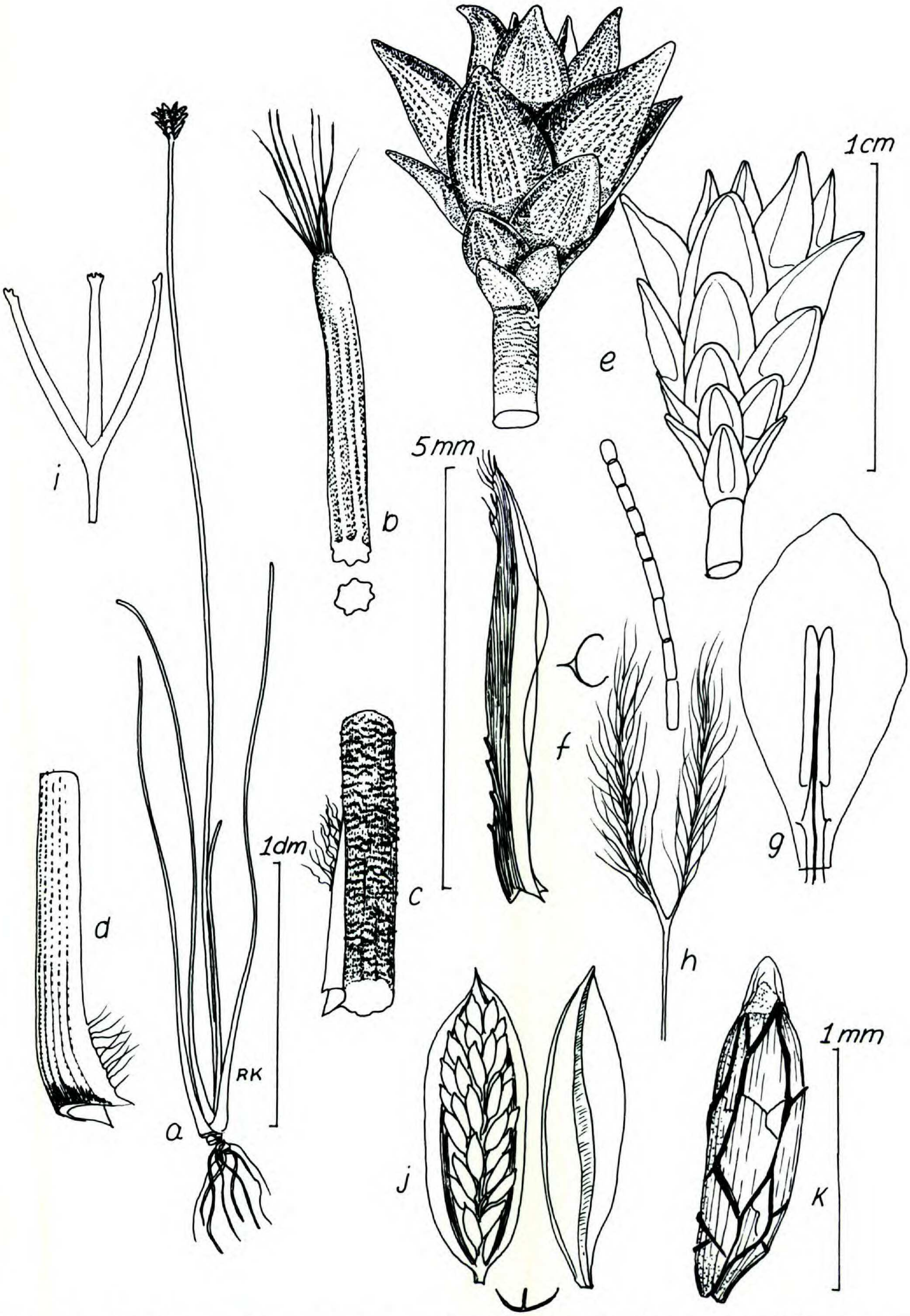


FIGURE 77. Xyris frequens *(from the type).—a. Habit sketch.—b. Leaf apex.—c. Leaf at blade–sheath junction.—d. Leaf base.—e. Spike (at left in fruit, at right dried spike at anthesis).—f. Lateral sepal.—g. Petal, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule, one valve removed; one valve, inner view.—k. Seed.*

more terete scape and leaf blade and a taller habit. Tips of most principal leaves have conspicuous tufts of pale, bristly trichomes.

78. Xyris subglabrata Malme, Bull. Torrey Bot. Club 48: 322. 1931. TYPE: Venezuela. T. F. Amazonas: Grand Savanna, section 1, in swampy ground, petals crimped, orange-yellow. Esmeralda, ca. 325 ft., 1 Nov. 1928, *G. H. H. Tate 303* (holotype, NY; phototype, F). Figure 78.

Xyris garcia-barrigae Idrobo & Lyman B. Smith, Caldasia 6: 204, fig. 8. 1954. TYPE: Colombia. Amazonas: Sabana de la Angostura, ca. 400 m, Río Caqueta, Araracuara, 21 Dec. 1951, *H. García-Barriga & R. E. Schultes 14168* (holotype, COL; isotypes, NY, US).

Cespitose, hard- and fibrillose-based perennial 1–3.5 dm high, the stems short, up from a stocky, horizontal or ascending rhizome. Leaves erect or ascending (0.7)1–2 dm long; sheaths with margins arachnoid or cottony, or pilose-ciliate, abruptly dilated at very base, reddish brown or castaneous, red-brown above, strongly papillose-rugose or nearly smooth, narrowing gradually to blades, ligulate or eligulate, the scarious edges often densely cottony; leaf blades lineal, terete-fluted, often sulcate and few-ribbed ventrally, 0.5–1 mm thick, dull green or maroon tinted, tapering to narrowly conic tips, these sometimes pilose-tufted, the surfaces smooth or papillose-rugulose toward base. Scape sheaths roughly equal to leaves and appearing like them. Scapes straight or flexuous, pale red-brown, slightly twisted, subterete distally, 0.7–1 mm thick, ecostate or striate, sometimes sulcate, papillose or smooth. Spikes ovoid to broadly ellipsoid, globose or obovoid, ca. 5–7 mm long, dark brown with several firm, spirally imbricate bracts having strong dorsal areas, also often with tips and base of bracts bearing white-villous patches; the lowest sterile bracts less than ½ length of the fertile ones, ovate, ecarinate; fertile bracts broadly obovate, ca. 5–6 mm long, convex-rounded-backed, the apices broadly rounded, entire, the dorsal areas broadly triangular with strong mid and lateral nerves. Lateral sepals free, slightly inequilateral, lanceolate, ca. 4.5–5 mm long, acute, deep lustrous yellow-brown, the firm keel villosulous or ciliate above middle. Petal blades broadly obovate, 4 mm long, yellow, the broadly rounded apices erose-denticulate. Staminodia bibrachiate, the narrow branches long-penicillate. Anthers oblong, ca. 2 mm long, deeply bifid and auriculate, extrorse, on stout filaments ca. 1 mm long. Capsule narrowly obovoid, somewhat compressed dorsiventrally, ca. 3 mm long, placentation appearing free-central, but valves with complete septa toward capsule base. Seeds oblong-short-cylindric or narrowly ovoid, ca. 0.6–0.7 mm long, apiculate, dark amber, finely lined and very finely cross-lined longitudinally.

Distribution. Mostly low-elevation, white-sand savanna, southeastern Colombia, southwestern Venezuela, and contiguous Amazonas, Brazil.

Additional specimens examined. BRAZIL. AMAZONAS: base of Serra Araca, 0–3 km S of central massif, 3 km E of Rio Jauari, 0°49′N, 63°19′W, 8 Feb. 1984, *G. T. Prance et al. 28885* (INPA, NY, VDB); plateau of northern massif of Serra Araca, 1,200 m, south side of North Mountain, open plateau savanna, 0°51′N, 63°21–22′W, 11 Feb. 1984, *G. T. Prance et al. 28979* (INPA, NY, VDB). COLOMBIA. VAUPÉS: Río Kuduyari, Cerro Yapaboda, ca. 450 m, 5 Oct. 1951, *Schultes & Cabrera 14234* (GH); same locality, 17 Nov. 1953, *Schultes et al. 18495* (GH); Río Paraná, Pichuna, trib. of Río Vaupés, ca. 700 ft., June 1953, *Schultes & Cabrera 19924, 19947* (GH); Cerro Yapoboda, ca. 900–1,000 ft., Apr. 1953, *Schultes & Cabrera 20055* (GH). VENEZUELA. T. F. AMAZONAS: sabana al pie del Duida, Jan.–Feb. 1969, *Farinias et al.* (NY, US); Sta. Cruz, margen del Río Atabapo, 4 Sep. 1960, *Foldats 3691* (NY, US, VEN); same locality, 9 Sep. 1960, *Foldats 3826* (NY, US, VEN); transecta, margen derecha del caño "Cabez de Manteco" afluente del Río Autana, a 2–3 km de la desembocadura, 12 Nov. 1984, *Melgueiro & Guánchez 17* (TFAV, VDB); transecto desde comunidad indigena de la etnia Piaroa, Río Autana en raudal "seguera," 90–110 m, 6 Nov. 1984, *Guánchez & Melgueiro 3306* (TFAV, VDB); 2–3 km SE del bajo Rio Guasacavi, 10 Mar. 1980, *Huber s.n.* (VEN); savana del bajo Río Ventuari, 20 km E la confluencia con el Río Orinoco, 11 Oct. 1977, *Huber 1062* (US, VEN); alrededores de Canaripo, Río Ventuari, 30 May 1978, *Huber 1913* (US, VEN); Savanna III, Cerro Yapacana, 100 m, 3 June 1978, *Huber 2053* (NY, US); Santa Barbara, 23 Aug. 1978, *Huber s.n.* (US, VDB); sabana, Caño Yagua, 24 Aug. 1978, *Huber 2557* (US); a unos 30 km al SE de la confl. Orinoco–Ventuari, 30 Nov.–1 Dec. 1978, *Huber & Tillett 2779* (US); sabana ubicada en la ribera NE de Caño Caname, 100 m, 30 June 1979, *Huber 4047* (VEN);

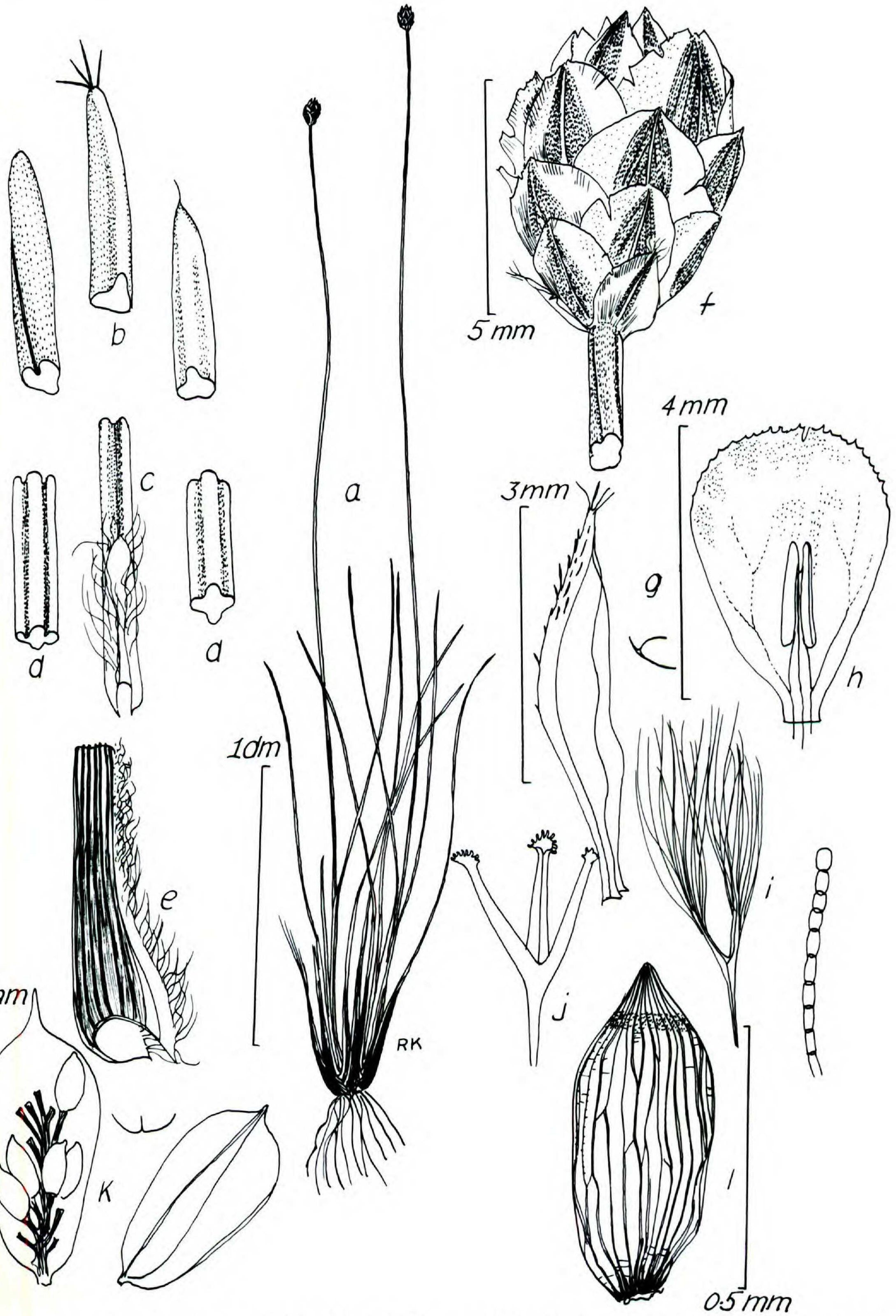


FIGURE 78. Xyris subglabrata (Kral 70692, 70709).—*a. Habit sketch.—b. Three types of leaf apices.—c. Leaf sheath–blade junction.—d. Two sorts of blade sectors.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair apex.—j. Stylar apex.—k. Capsule; at left with two valves removed to show placentation, at right a single valve showing septum.—l. Seed.*

2 km S del medio Río Puruname, al SE del Caserío de Puruname, 100 m, *Huber & Tillet 5454* (US, VDB); 20 km NW Yavita, cabeceras Caño Pimichín, 120 m, 11 Feb. 1981, *Huber & Medina 5949* (VDB, VEN); km 11 de la Carretera San Carlos–Solano, 120 m, 16 Sep. 1980, *Huber et al. 5673* (VEN); Savanna I, Cerro Yapacana, 10 Aug. 1983, *Kral & Huber 70692* (BM, F, K, L, MO, NY, SP, TFAV, U, US, VDB, VEN, and others); Savanna II, 10 Aug. 1983, *Kral & Huber 70709* (BM, F, K, L, MO, NY, SP, TFAV, U, US, VDB, VEN, and others); Cerro Moriche, Río Ventuari, 4,500 ft., 15 Jan. 1951, *Maguire et al. 30936A* (NY, US, VEN); Bana 12 km N San Carlos, 100–120 m, 6 Feb. 1977, *Morillo & Villa 5395* (VEN); "Bana de Mary," 10 km San Carlos de Río Negro a Solano, 27 Aug. 1982, *Ruiz et al. 4025* (MY); between Esmeralda Savana and SE base of Cerro Duida, 200 m, 22 Aug. 1944, *Steyermark 57826* (F, NY); Cerro Yapacana, 7 May 1970, *Steyermark & Bunting 103253* (US, VDB, VEN); Canaripo, 28 Dec. 1976, *Steyermark & Redmond 112806* (MO, US, VDB, VEN); same locality, 2 Mar. 1977, *Steyermark et al. 113824* (MO, US, VDB, VEN); Sabana de Moyo, rt. bank of Orinoco, 31 July 1959, *Wurdack & Adderley 43711* (NY, US, VEN). BOLÍVAR: Dist. Piar, llanura del Río Ambutuir medio, ca. 20 km al NE de Uriman, 600 m, 8 Dec. 1983, *Huber 8473* (NY).

This plant, along with *X. setigera* Oliver, often has the corolla attacked by a fungus, the spore masses lending an orange quality to the flower. This color is sometimes recorded on labels, but I have not seen any *Xyris* with healthy orange corollas. Consultation of the type material of *X. garcia-barrigae* and of other material so identified will show no significant differences from the earlier-named *X. subglabrata*.

79. Xyris lithophila Kral & Lyman B. Smith, sp. nov. TYPE: Venezuela. Bolívar: Dist. Roscio, arbustales, sabana rocosa y vegetación ribereña en los alrededores del Salto "La Milagrosa," ca. 15 km al SW de S. Ignacio de Yuruaní. Formando pequeñas colonias sobre rocas en el lecho del río, 4°55′N, 61°14′W, 1,000 m, 22 June 1983, *O. Huber & Clara Alarcon 7568* (holotype, VEN; isotypes, MYF, VDB). Figure 79.

Planta perennis, caespitosa, gracilis. Radices graciles. Caules breves. Folia principalia erecta, subtorta, flexuosa, 0.8–2 dm longa, leviter papilloso-rugulosa, vaginis scaporum longiora; laminae 2–3-plo vagines longiores, filiformes, leviter compressae vel subteretes, 0.5–0.8 mm latae, longitudine leviter nervosae, nitidae, pallide olivaceae vel spadiceae; apices peranguste conicae aut subulatae; vaginae ecarinatae, pallide ferrugineae, ad basin leviter dilatatae, multicostatae, brunneolae, multicostatae, in laminas gradatim decrescentes, aciebus dense longivillosis, trichomatibus pallidis. Vaginae scaporum multicostatae, tubulosae, apicem versus apertae, laminis brevibus. Scapi 2–3.5 dm alti, glabri, leviter torti, nitidi, leviter papillosi, olivacei, ad apicem tereti, leviter striati. Spicae pauciflorae, ellipticae vel obovoideae, 7–9 mm longae, obtusae. Bracteae erectae, laxe spiraliter imbricatae, ecarinatae sed mediane conspicue constatae, integrae, pallide brunneolae, basin versus atrocastaneae; bracteae steriles 4, pari infimo late oblongo, ca. 4–5 mm longo, rotundato, ½–⅔-plo spica longiori; bracteae fertiles late oblongae vel anguste obovatae, ca. 6–6.5 mm longae, rotundatae, area dorsali anguste triangulata, atroferruginea. Sepala lateralia libera, subaequilatera, oblanceolata, 5.5–6 mm longa, leviter curvata, acuta; ala carinali lata a medio ad apicem lacerato-vel-fimbriato-ciliata. Laminae petalorum late obovatae, 4.5–5 mm longae, luteolae, ad late rotundatum apicem erosae. Staminodia bibrachiata, brachiis a basi ad apicem longipenicillatis. Antherae anguste oblongae, ca. 2 mm longae, profunde bifidae et sagittatae, filis ca. 1.5 mm longis. Capsula matura non visa sed quasi maturas capsulas et seminas vidi: sic, fructificatio cylindrica, ca. 3 mm longa et placenta centralis, valvis capsulae profunde septatis a basi ad apicem; semina numerosa ellipsoidea, ca. 0.7 mm longa, translucida, longitudine leviter multilineata.

Slender, tufted perennial; roots slender; stems short. Main foliage leaves erect, slightly twisted and flexuous, 0.8–2 dm long, lightly papillose-rugulose, longer than the scape sheaths; blades 2–3 times longer than the sheaths, filiform, slightly compressed or subterete, 0.5–0.8 mm wide, longitudinally finely nerved, shining, pale olive green to brownish; tips narrowly conic or subulate; sheaths ecarinate, pale reddish brown, slightly dilated at base, multicostate, brownish, gradually narrowing into blades, the margins densely longvillous, the trichomes pale. Scape sheaths multicostate, tubular, opening toward apex, short-bladed. Scapes 2–3.5 dm high, smooth, slightly twisted, shining, lightly papillose, olivaceous, terete toward apex, finely striate. Spikes few-flowered, elliptic to obovoid, 7–9 mm long, obtuse. Bracts erect, loosely spirally imbricate, ecarinate but with conspicuous midrib, entire, pale brown, deep castaneous toward base. Lateral sepals free, subequilateral, oblanceolate, 5.5–6 mm long, slightly curvate, acute; keel broad, lacerate- to fimbriate-ciliate from middle to apex. Petal blades broadly obovate, 4.5–5 mm long, yellow, the broadly rounded apex erose. Staminodia bibrachiate, the branches long-penicillate from

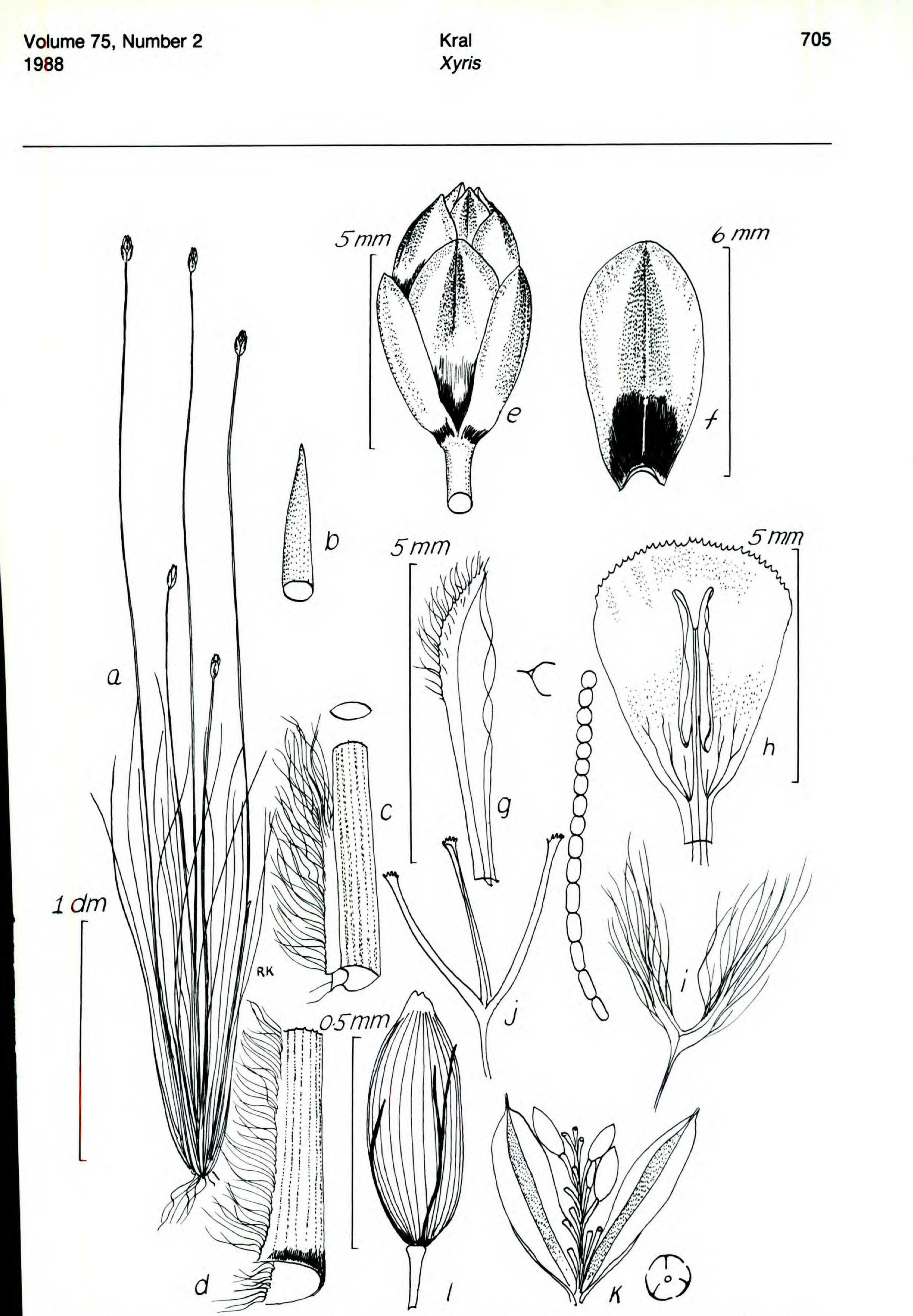


FIGURE 79. Xyris lithophila *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf–sheath junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode, enlarged beard hair apex.—j. Stylar apex.—k. Capsule, opened, one valve removed, showing placentation and septa (stippled) on two valves.—l. Seed.*

base to tip. Anthers narrowly oblong, ca. 2 mm long, deeply bifid and sagittate on filaments ca. 1.5 mm long. Nearly mature fruit cylindric, ca. 3 mm long, the capsule valves deeply septate, the placentae central.

Distribution. Known only from the type locality.

The complex to which this slender plant belongs involves *X. setigera*, *X. delicatula*, and *X. carinata*, all of which are slender-leaved with foliage variously rugulose, the very thin sheath margins delicately pilose or villose. This taxon is distinguished primarily on the basis of smooth scapes (as in *X. setigera*) and conic-subulate tips to its slender leaves. The leaf tips not excentrically pointed, bract edges entire, and bract backs with very distinct dorsal areas are not usual in the complex.

80. Xyris carinata Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 36, fig. 21A–E. 1963. TYPE: Venezuela. T. F. Amazonas: occasional in *Bonnetia*–grass savanna, summit Cerro Guanay, Caño Guaviarito, 1,800 m, Río Manapiare, Río Ventuari, 4 Feb. 1951, *B. Maguire, K. D. Phelps, C. B. Hitchcock & G. Budowski 31773* (holotype, NY; isotypes, US, VEN). Figure 80.

Slender, cespitose perennial 2–3 dm high, the stem short. Leaves erect or ascending, 1–1.5 dm long; sheaths mostly less than ½ as long as blades, pilose-ciliate, at very base brown or stramineous and papillose-rugulose, more scabrid and rugose above, reddish, tapering to blade, eligulate or with a short, broad, rounded-scarious ligule, ecarinate; blades narrowly lineal, twisted and flexuous, flattened (oblong in cross section), 0.8–1 mm wide, narrowed above middle, then abruptly bluntly conic-tipped, smooth, the edges thick and rounded, tuberculate-rugose, the sides strongly verrucose-rugose, green with maroon tints. Scape sheaths shorter than leaves, tubular, twisted and costate, open distally, tipped with cusplike, erect, blunt blades. Scapes flexuous and twisted, distally terete, 0.7–0.8 mm thick, papillose-rugulose. Spikes ellipsoid, aging obovoid, 7–8 mm long, dull brown or tan, of several erect but loosely imbricate, firm, spirally arranged bracts with narrowly elliptic, subapical dorsal areas and papillose, rounded backs; lowest sterile bracts much smaller than the fertile bract, ovate, narrowly rounded, grading into the fertile bracts, the outer fertile bracts narrowly obovate or oblong, ca. 7–8 mm long, narrowly rounded, subentire, with narrow, short, subapical carinae, the inner bracts progressively more folded and carinate. Lateral sepals free, subequilateral, oblanceolate, ca. 6 mm long, acute, tan with the thin, darker keel ascending-ciliate from middle to apex. Petal blades narrowly obovate, ca. 5 mm long, yellow. Staminodia bibrachiate or (anomalously) compound, 2- or 4-branched, the branches long-penicillate. Anthers oblong, deeply bifid, deeply sagittate, ca. 2 mm long on filaments ca. 1 mm long. Capsule narrowly obovoid-cylindric, ca. 4 mm long, the ovary trilocular with septa breaking from axis at maturity, falling with valves. Seeds numerous, ellipsoid, ca. 0.7 mm long, acute, dark amber, longitudinally with ca. 12–14 strong ribs per side.

Distribution. High, sandy rocky savanna at medium to high (over 1,000 meters) elevations, southern Venezuela and contiguous Brazil.

Additional specimens examined. BRAZIL. TERR. RÓRAIMA: vic. Auaris 4°3′N, 64°22′W, upper slopes of Serra Parima, S of Auaris, 1,400–1,520 m, rocky outcrop in seepage, Feb. 1969, *Prance et al. 9808* (F, K, U, US); same locality, 1,200 m, 30 July 1974, *Prance et al. 21564* (U, NY, US, GH). VENEZUELA. T. F. AMAZONAS: cumbre del Cerro Autana, 1,230–1,240 m, 20–22 Sep. 1971, *Steyermark 105142* (US); Sierra Parima, cabeceras del Río Matacuni, a lo largo de la frontera Venezolana–Brasilera, 1,500 m, 19 May 1973, frontera no. 7, 4°5′N, 64°40′24″W, *Steyermark 107505* (F, MO, US, VEN). BOLÍVAR: altiplanicie del Auyan-tepui, sector SSW de la meseta, al W de la cumbre sur, ca. 2,070 m, 27 Aug. 1983, *Huber et al. 8079* (NY, VDB, VEN); Mount Auyan-tepui, 2,200 m, Dec. 1937, Jan. 1938, *Tate 1320* (NY).

Yet another of the growing number of species from the Guayana Highlands that, while placed in *Nematopus*, actually have

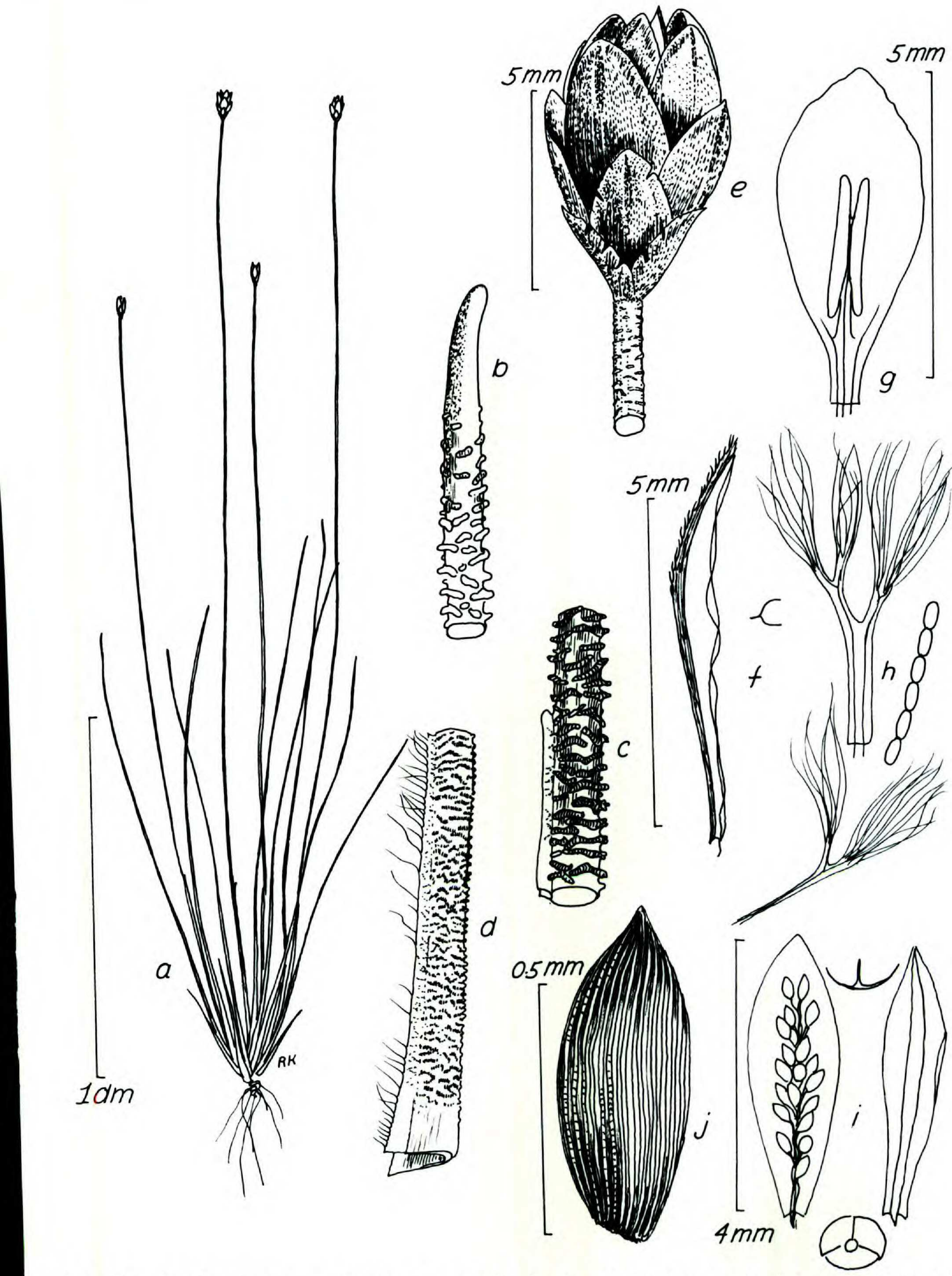


FIGURE 80. Xyris carinata *(from the type)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base (more reduced than other leaf sketches).—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminodia, one of them compound.—i. Capsule outline, placenta superimposed; inner view of one valve showing septum.—j. Seed.*

axile placentation. Further study of this species complex, which is around *X. setigera*, may require reduction of several of these entities to the level of variety or subspecies.

81. Xyris setigera F. Oliver, Trans. Linn. Soc. London, Bot. 2: 285, pl. 50A, figs. 1–8. 1887. TYPE: Venezuela. Bolívar: Roraima (Venezuela), 4,000 ft., 4 Dec. 1884, *Everard F. im Thurn 62* (lectotype, K; isolectotypes, BM, US). Figure 81.

Xyris setigera var. *elongata* Steyerm., Fieldiana, Bot. 28(1): 112. 1951. TYPE: Venezuela. Bolívar: Ptaritepui, dry sandy and rocky sandstone exposures on level ground adjacent to swamp on plateau portion of southeast-facing slopes, 1,600 m, 1 Nov. 1944, *J. A. Steyermark 59660* (holotype, F; isotypes, GH, NY).

Densely cespitose, stiffish perennial, mostly 1.5–6 dm high; stems contracted to slightly elongated. Leaves erect to spreading flabellately or ascending, 0.5–2.5 dm long; sheaths dark to pale, red-brown or purple-red, mostly more than ½ as long as blades, the edges long-ciliate, narrowing gradually from the dilated, scabro-rugose (rarely smooth) base into the blades, there eligulate or in high-elevation forms sometimes producing a ligule to 2 mm long, the blades narrowly linear to filiform (in high-elevation forms), usually flattened, 0.5–3 mm wide, at apex excentrically short-spinulose or narrowly conic-subulate, the margins thick, scabro-ciliate or tuberculate-scabrid with strumose, antrorsely or retrorsely bent, simple or branched trichomes or tubercles (rarely smooth in high-elevation forms), the surfaces deep green to maroon or olive, tuberculate-rugose or smooth, punctate. Scape sheaths shorter than leaves, the bases tubular, multicostate and keeled, often reddish or roseate or lucid brown, open distally, keeled, producing a short, strong blade similar to leaves. Scapes straight or flexuous, twisted, terete distally, ca. 0.5–1 mm thick, smooth, often lustrous, punctate, maroon to green. Spikes ovoid to ellipsoid, 0.5–1 cm long, aging obovoid or turbinate, pale to deep brown, of several loosely spirally imbricate, stiff bracts usually without distinct dorsal areas (occasional extremes with narrow, indistinct dorsal areas); sterile bracts few, oblong, spreading, ecarinate, smaller than and grading into fertile bracts, these oblong to narrowly obovate, ecarinate, 6–7 mm long, narrowly rounded apically, entire, aging lacerate, the backs slightly convex. Lateral sepals free, subequilateral, mostly oblanceolate, 5–6 mm long, acute, dark reddish brown, the keel at middle and above lacerate-serrulate to nearly entire. Petal blades broadly obovate, ca. 6 mm long, yellow, the rounded apex subentire. Staminodia bibrachiate, the slender branches densely long-penicillate. Anthers 1.7–2 mm long, narrowly oblong, deeply bifid and sagittate, on filaments 0.8–1 mm long. Capsule cylindric-ellipsoid, ca. 4.5 mm long, the placentation axile, the septa separating from the central (placental) axis as the valves part. Seeds numerous, ellipsoid-ovoid, ca. 0.5–0.6 mm long, 2-apiculate, dark amber, longitudinally finely but strongly ribbed and with several less distinct cross-lines.

Distribution. Medium- to high-elevation, sandy or rocky savanna, centering in the massifs of the Gran Sabana, Estado Bolívar, Venezuela, southward shortly over the border of Brazil, eastward into eastern Guyana and northern Territorio Roraima, Brazil.

Additional specimens examined. BRAZIL. RORAIMA: Mt. Roraima, *E. F. Thurn 62* (the type for the species at K shows that some of the set could have come from the Brazil side of Roraima); ? Philipp Swamp, 5,100–5,200 ft., 11 Nov. 1927, *Tate 336* (K—? locality listed for Brazil, British Guiana, and Venezuela, depending on collector at this site). GUYANA: Kaieteur Plateau, 2 May 1944, *Maguire & Fanshawe 23164* (K); southern Pakaraima Mts., Kopinang Savanna, Kopinang Falls, 2,700 ft., 29 Aug. 1961, *Maguire et al. 45988* (K, VEN). VENEZUELA. (Note—this is perhaps the most common and commonly collected species in Estado Bolívar; therefore few citations are given here. A complete list will be made available later.) BOLÍVAR: Cienagas del Cerro Uaipan, 1,750 m, Río Caroní, 26 Nov. 1946, *Cardona 200g* (US, VEN); 2 km S of La Ciudadella, 1,300 m, 3 Dec. 1973, *Davidse 4699* (MO, VDB); ca. 17 km NE Ikabarú, 1,100 m, 7 Oct. 1982, *Huber et al. 6727* (MYF, VDB, VEN)—this material has dorsal areas; sabanas, sector norte de la Gran Sabana, 1,030 m, 5 Mar. 1982, *Huber et al. 7337* (MYF, VDB, VEN); cumbre del Cerro Chirikayne ca. 15 km NW Sta. Elena de Uairen, 1,580 m, 25 June 1983, *Huber et al. 7601* (MYF, VDB); Cerro Venado ca. 20

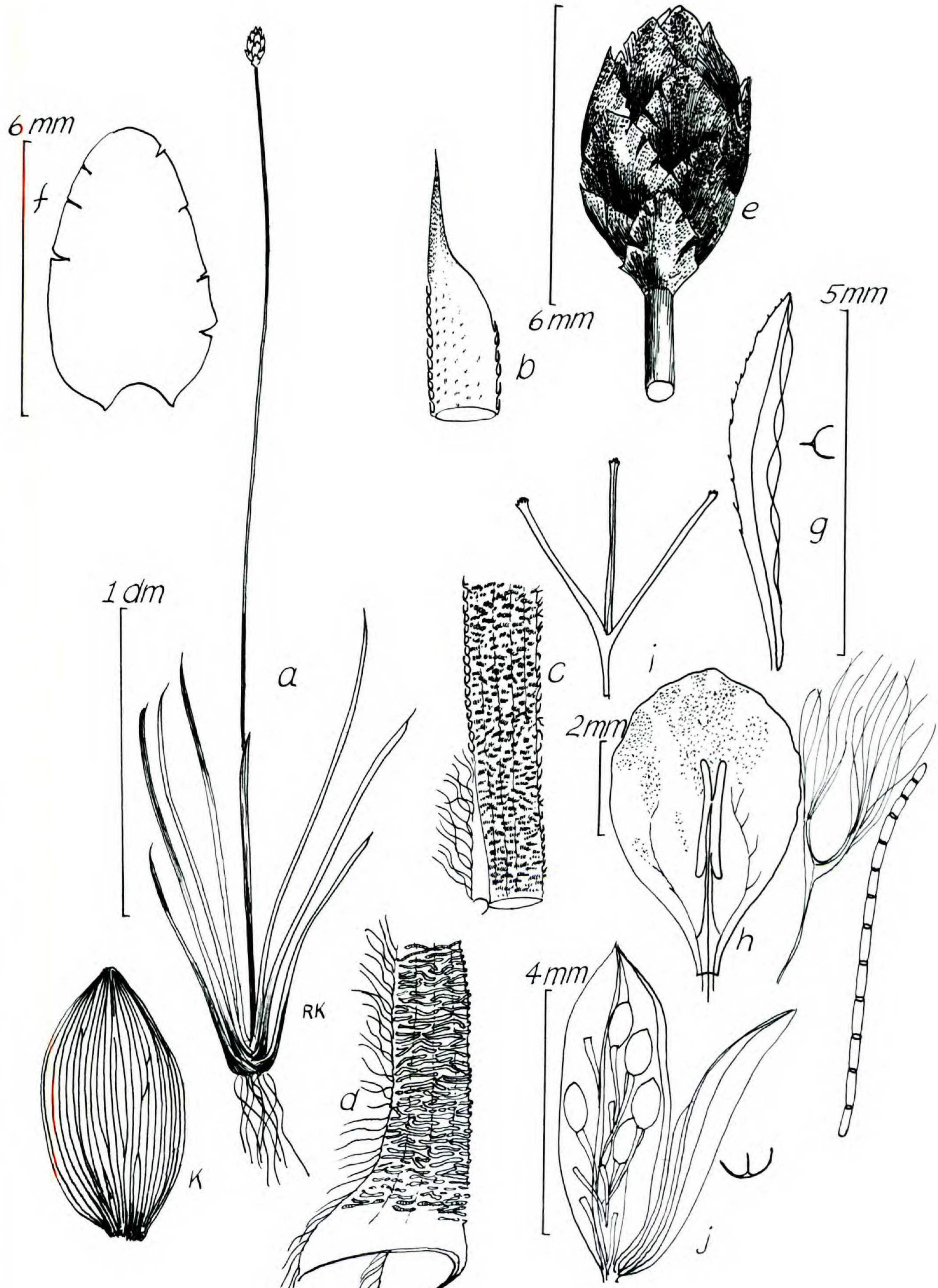


FIGURE 81. Xyris setigera (Kral 70630).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract outline.—g. Lateral sepal.—h. Petal blade, stamen, staminode, staminodial beard hair.—i. Stylar apex.—j. Capsule, dehisced, showing placentation and side view of one valve.—k. Seed.*

km E de Canaima, 1,300 m, 31 Aug. 1983, *Huber et al. 8251* (NY, VDB, VEN); Macizo del Chimantá, sector SSE suroriental del Acopan-tepui, 1,920 m, 13–16 Feb. 1984, *Huber et al. 9061* (NY, VDB, VEN); Chimantá, Churi-tepui, 2,250 m, 28 Mar. 1984, *Huber 9271* (MYF, VDB); Brazo Occidental del Auyantepui, 1,650 m, 13 Nov. 1984, *Huber 9732* (MYF, VDB); ca. 5 km NNW Parupa, 1,400 m, 20 Nov. 1984, *Huber 9841* (MYF, VDB); Meseta Guaiquinima, sector nororiental, ca. 2,000 m, 21 Nov. 1984, *Huber 9877* (MYF, VDB); ca. 30 km ESE Kamarata, 900 m, 12 Dec. 1984, *Huber et al. 9919* (MYF, VDB); just S of summit La Escalera, 24 July 1983, *Kral & Gonzalez 70364, 70365* (BM, F, K, L, MO, NY, U, US, VDB, VEN, and others); 28 km E of Kavanayen, 25 July 1983, *Kral & Gonzalez 70432* (NY, US, VDB, VEN); 46 km N of Sta. Elena, 27 July 1983, *Kral & Gonzalez 70557* (F, K, MO, NY, SP, US, VDB, VEN); 8 km N of San Rafael, 29 July 1983, *Kral & Gonzalez 70580* (BM, F, K, L, MO, NY, SP, US, VDB, VEN, and others); 15 km S of San Rafael, 29 July 1983, *Kral & Gonzalez 70627* (BM, F, K, L, MO, NY, SP, US, VDB, VEN); 3 km S summit La Escalera, 1,300 m, 30 July 1983, *Kral & Gonzalez 70630* (BM, F, K, L, MO, NY, U, US, VDB, VEN, and others); savanna between San Raphael and Enemasic, 1,200 m, 5 Feb. 1952, *Maguire 33174* (NY, US, VEN); Kavanayen, ca. 1,200 m, 9 Aug. 1970, *Moore et al. 9646* (US, VEN); cumbre de Uaipan, 1,900 m, Jan. 1948, *Phelps 375* (NY, US); Plateau of Auyan-tepui, central northern section of eastern branch, 1,940 m, 27 Aug. 1983, *Prance & Huber 28270* (MYF, NY, VDB); Roraima, Emerald Swamp, 1,520 m, 25 Sep. 1944, *Steyermark 58611* (F, NY, VEN); Ptari-tepui, 1,600 m, 1 Nov. 1944, *Steyermark 59664* (F, NY, US, VEN); mesa between Ptari-tepui and Sororopan-tepui, 1,615 m, 15–17 Nov. 1944, *Steyermark 60239* (F, K); Auyan-tepui, 1,660–1,800 m, 11 May 1964, *Steyermark 93684* (NY, U, US, VDB, VEN); Gran Sabana, km 148, 1,350–1,400 m, 21 Dec. 1970, *Steyermark et al. 104168* (U, US, VBD, VEN); 47 km N de Sta. Elena, S del Río Yuruaní, 1,200 m, 25 Aug. 1976, *Steyermark et al. 112341* (F, K, NY, US); Meseta del Jaua, Cerro Jaua cumbre, 28 Feb.–5 Mar. 1974, *Steyermark et al. 109427* (K, NY, US, VEN); Cerro Marutari, 1,200 m, 2 Jan. 1981, *Steyermark 123857* (NY, VDB); Meseta de Sarisarinama, 1,280 m, 14 Feb. 1981, *Steyermark 124319* (NY, VDB); Luépa (Ciudadela) savanna 200 m W of checkpoint, *Thomas 2702* (NY).

This species is, not surprisingly, the most variable xyrid in the Guayana Highlands, with populations being found throughout the Gran Sabana at elevations extending from 700 to 2,000 meters or more on tepuis. Those of the lower and middle elevations within this area mostly conform to the described morphology pretty well, with the foliage generally coarsely rugose; the leaf blade edges roughened with stiff, often branched hairs; the leaf tips excentrically short-spinulose; and the spike bracts many, dark, and erose with age. At the higher elevations in the tepuis, usually at ca. 2,000 meters upward, however, the plants are more slender in scape and leaf; the leaf tips are subulate-conic (rather than excentrically spinulose) with the surfaces and edges becoming smoother; and the blades are narrower and approaching terete. These are problem plants; many are in loans annotated *X. setigera* var. *elongata* Steyerm. Some need further study, as they border on or are the same as *X. byssacea*. A smut fungus infects flowers to produce a bright orange fruiting mass on the spikes, hence the erroneous records that some *Xyris* corollas are "orange."

82. Xyris riparia Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 20, fig. 5A–E. 1963. TYPE: Venezuela. Bolívar: frequent in clumps at stream edge, scrub forest near Summit Camp, 1,925 m, Chimantá Massif, central section, 2 Feb. 1955, *J. A. Steyermark & J. J. Wurdack 361* (holotype, NY; isotypes, MO, US, VEN). Figure 82.

Cespitose, slender, stiffish perennial ca. 4–5 dm high, the stems short to elongate, forming frondlike plates of leaves. Leaves spreading flabellately to erect, 1–2.5 dm long; sheaths coarsely to finely long-ciliate-margined (sometimes sparsely so), as long as blades, deeply dull reddish brown, dull brown or castaneous, scabro-rugose or smooth, tapering gradually from the dilated base to the blade, the backs narrowly rounded or keeled and scabrid, usually eligulate or with a short, erect ligule under 0.5 mm long; blades linear, flattened, slightly twisted, 2–3 mm wide, tapering gradually from ca. middle to apex, then abruptly narrowed to an excentric, narrowly conic-acute to short-subulate tip; margins thin or pale-incrassate, smooth to papillate, tuberculate or scabro-ciliate or ciliolate with pale hairs, the surfaces yellow-green to reddish, few-nerved, punctate. Scape sheaths shorter than principal leaves, the tubular base lustrous reddish or castaneous, multicostate above, ciliate-keeled, open, with a short, erect

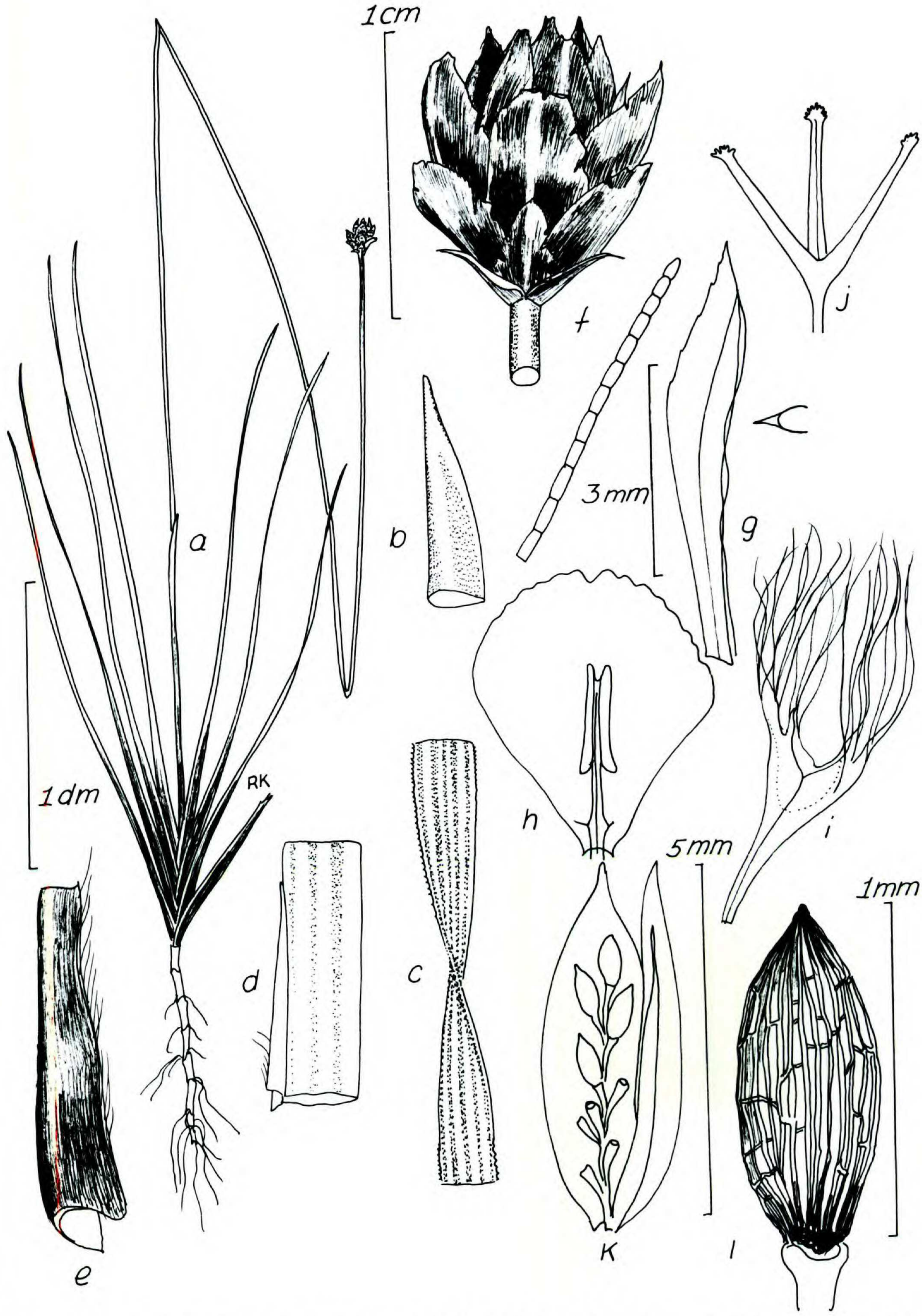


FIGURE 82. Xyris riparia *(from the type)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf, midblade.—d. Leaf blade–sheath junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Capsule, one valve removed; side view of one valve to show septum and side view of placenta.—l. Seed.*

blade. Scapes straight or slightly flexuous, twisted distally, subterete or broadly oval in cross section, ca. 1 mm wide, ecostate, sometimes with few very low ridges, punctate. Spike broadly obovoid, drying turbinate, ca. 1 cm long, reddish brown, of several, firm, papillose bracts without dorsal areas and loosely imbricate in near vertical rows; sterile bracts with lowermost lance-ovate, much shorter than and narrower than the fertile bracts, carinate, grading into fertile bracts, these numerous, oblong to narrowly ovate, 6–8 mm long, narrowly rounded, entire, aging lacerate, the margins often narrowly squarrose. Lateral sepals linear-oblanceolate, 6.5–7 mm long, acuminate, dark red-brown, the firm, broad keel slightly lacerate distally. Petal blades broadly obovate, ca. 5 mm long, yellow, the broadly rounded apex crenulate. Staminodia clavate, indistinctly bibrachiate, the irregular margins long-penicillate. Anthers lance-oblong, ca. 2 mm long, shallowly bifid and sagittate, on filaments ca. 1 mm long. Capsule narrowly ellipsoid, ca. 5 mm long, the placentation appearing central but dehiscing valves with strong septa toward base. Seeds numerous on short, stout funiculi, narrowly ovoid, ca. 0.9–1 mm long, deep amber, apiculate, longitudinally strongly multiribbed and cross-lined.

Distribution. Local in high-elevation savanna, the Chimantá Massif and Cerro Guaiquinima, Estado Bolívar, Venezuela. The few known records, in addition to the type are as follows.

Additional specimens examined. VENEZUELA. BOLÍVAR: Cerro Guaiquinima, savanna vic. Cumbre Camp, 2,000 m, 25 Dec. 1951, *B. Maguire 32751* (NY); same locality, 1 km S of Cumbre Camp, 1,800 m, 29 Dec. 1951, *B. Maguire 32798* (NY); Macizo del Chimantá, sección centro-suroriental del Churi-tepui, ca. 2,250 m, 10–12 Feb. 1984, *Huber & Colella 8998* (VDB, VEN)—this an extreme bordering on *X. setigera*.

The material from Cerro Guaiquinima should perhaps be considered varietal, being more scabrid in sheath, more ciliate in leaf, and with a shorter range in leaf length, but at this stage of knowledge of the genus it is perhaps best to be conservative. In such a connection, it might be noted that there are many similarities between this taxon and the more common *X. setigera*, certainly as to the punctate leaves and scapes, the complex harsh hairs on edges of the leaf blade, and the excentrically spinulose-subulate leaf tips.

83. Xyris roraimae Malme in Pilger Notizbl. Bot. Gart. Berlin 6: 117. 1914. TYPE: Venezuela. Bolívar: "Auf den unteren Campos," 1,700 m, Jan. 1910, *Ule 8546* (lectotype, B; isolectotype and phototype, US). Figure 83.

Tall, solitary or small-tufted, brittle perennial to 1 m high or slightly higher, the stems contracted, the foliage totally papillose-rugulose, dull yellow-green. Leaves erect or ascending, twisted, 2–4 dm long; sheaths long-ciliate, ½ as long as blades or longer, abruptly dilated at very base, castaneous, thence abruptly narrowing, dull brown, gradually tapering into the blade, there eligulate or with a short, erect, ciliate ligule less than 0.5 mm long; blades strongly flattened, linear, 3–5 mm wide, above middle tapering to an erect, narrowly acute or acuminate, somewhat thickened, erect or incurved apex, the margins pale ciliate and tuberculate, the surfaces dull yellow-green, strongly nerved longitudinally. Scape sheaths shorter than leaves, twisted, carinate and strongly costate, opening toward apex, keeled, producing a very short, incurved blade. Scapes lineal, twisted and flexuous, flattened and ancipital distally, 2–3 mm wide, 2-costate, the costae reaching the edges and densely pale ciliate. Spikes broadly ovoid, ellipsoid, or cylindric, 1–3 cm long, blunt, pale red-brown or tan, of very many spirally imbricate, thin bracts without dorsal areas and, when young, with narrow but distinctive, reddish, scarious, lacerate borders; lowermost sterile bracts smallest, broadly ovate to suborbicular, slightly carinate, grading gradually into the fertile bracts, these broadly obovate to suborbicular, 5–6 mm long, ecarinate, aging lacerate (the red border friable and deciduous early). Lateral sepals free, very inequilateral, often exserted apically, oblanceolate, 4.5–5.5 mm long, acute, thin,

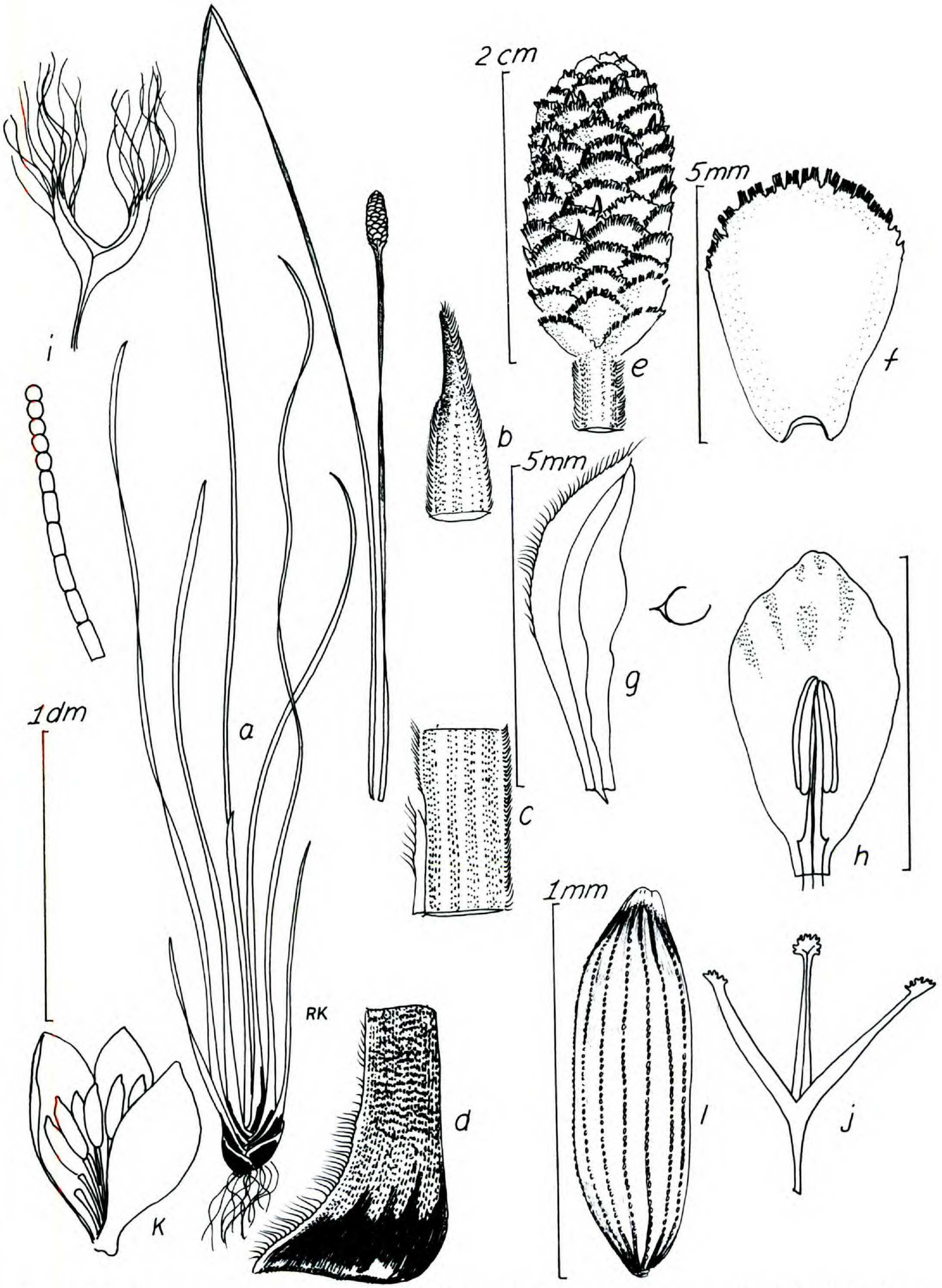


FIGURE 83. Xyris roraimae *(*Kral 70560*)*.—*a. Habit sketch.—b. Leaf apex.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike.—f. Fertile bract.—g. Lateral sepal.—h. Petal blade, stamen.—i. Staminode.—j. Stylar apex.—k. Open capsule.—l. Seed.*

with the broad keel lacerofimbriate or ciliate from ca. middle to apex. Petal blades obovate, ca. 5 mm long, yellow, the narrowly rounded apex subentire. Staminodia bibrachiate, the flat, narrow branches long-penicillate distally. Anthers lance-oblong, ca. 2 mm long, shallowly bifid apically, the base deeply sagittate, on filaments ca. 1 mm long. Capsule broadly obovoid, 2.5–3 mm long, the placentation basal, the valves without septa. Seeds ellipsoid-cylindric, ca. 1 mm long, amber, apiculate, finely but distinctly ribbed longitudinally.

Distribution. Savanna bogs, medium elevations (ca. 700–1,500 meters), Gran Sabana, Estado Bolívar, Venezuela; Guyana; occasional in the campos rupestres, the planalto of Brazil in Minas Gerais and Goiás. My Brazilian specimens tend to be proportionately larger in height (to 1.5 meters) and in spike diameter, but otherwise appear the same as the Venezuelan collections.

Additional specimens examined. BRAZIL. MINAS GERAIS: wet slopes over arenaceous rock, above Rio Itacambirucu, ca. 8 km WSW of Grão Mogul, 600–750 m, 10 July 1985, *Kral et al. 72705* (SP, VDB, and to be distributed) grass–sedge campo, Morro do Onca, 950–1,000 m N of Jouachim Felicio, 6 July 1985, *Kral et al. 72628* (SP, VDB, and to be distributed); below sandstone bluffs, Morro do Jucao, NNW Joachim Felicio, 1,100 m, ca. 14 km N of Jouaquim Felicio, 7 July 1985, *Kral et al. 72659* (SP, VDB, and to be distributed). GUYANA: Mt. Roraima, Philipp Swamp, 5,100–5,200 ft. (also at Glycon Swamp), 11 Nov. 1927, *Tate 348* (K). VENEZUELA. BOLÍVAR: bog ravine, 1 km E of Kavanayen, 26 July 1983, *Kral 70448* (VDB, VEN); 7 km E of Kavanayen, 1,100 m, bog, 26 July 1983, *Kral & Gonzalez 70466* (BM, F, K, L, MO, NY, SP, U, US, VDB, VEN, and others); S side of road, 1.5 km E of Kavanayen, Gran Sabana, *Kral & Gonzalez 70539* (F, MO, NY, SP, US, VDB, VEN); 46 km N of Sta. Elena on E side of Ven. 10, ca. 800 m, 28 July 1983, *Kral & Gonzalez 70560* (BM, F, L, MO, NY, SP, U, US, VDB, VEN, and others); colinas above Ven. 10, 8 km N of El Salto Yuruani, ca. 750 m, 29 July 1983, *Kral & Gonzalez 70582* (US, VDB, VEN); ca. 2 km S due E of Kavanayen, ca. 1,060 m, 15 Dec. 1984, *Kral 72089* (MYF, VDB, VEN, and to be distributed); Ilu-tepui, Gran Sabana, Río Aponangao at 1,200 m, 27–28 Mar. 1952, *Maguire 33646* (NY); Gran Sabana, cabeceras Río Aponguao, a lo largo Arauta-paru, km 148, 20 Dec. 1970, *Steyermark et al. 104116* (US, VEN); savanna with *Stegolepis* 16 km from Kavanayen, 1,340 m, 19 Dec. 1979, *Steyermark* with *Pruski 121052* (US, VEN).

This species, locally abundant in the rapateaceous bogs of the Gran Sabana, is at once one of the tallest of Venezuelan xyrids and the most roughened in foliage, the epidermal roughening giving the plants a glazed, dull, yellow-green color which is very distinctive in the field. Its spikes are a lovely tint of golden brown and on close inspection show a fine red color of bract border. Even larger versions of this attractive (for a *Xyris*) plant are to be found in the planalto of Brazil, where they belong to the most difficult complex around *X. ciliata* Thunb.

84. Xyris schneeana Lyman B. Smith & Steyerm., Acta. Bot. Venez. 1(7): 149–150. 1965. TYPE: Venezuela. Bolívar: Auyan-tepui, altiplanicie, 19 Apr. 1956, *Ludwig Schnee 1577* (holotype, MY; phototype, US). Figure 84.

Cespitose low perennial 1–3 dm high, the stems contracted. Leaves stiff, spreading flabellately, 5–10 cm long; sheaths as long as blades or longer, long-ciliate, papillose-rugulose, tan, much dilated at very base, thence narrowing gradually to blade, strongly keeled, eligulate, the blades flat, straight, 2–3 mm wide, lineal, abruptly narrowed at apex to an obtuse or broadly incurved-acute tip, this frequently apiculate, the margins white-ciliolate, the surfaces dull green, low-multiribbed, scaberulous-rugulose. Scape sheaths overtopping most leaves, the bases tubular, multicostate, carinate, above open, ciliate, the blade a mere apiculus. Scapes dull green, straight or flexuous, terete or oval distally, ca. 0.5 mm thick, with several low costae, the surface entirely rugulose-papillate or scaberulous. Spikes ovoid-ellipsoid, ca. 5 mm long, drying obovate, dark olive-castaneous, of several loosely subdecussate, thin bracts without evident dorsal areas, the sterile ones ca. 4, ecarinate, rounded, shorter than the few fertile bracts, these oblong, ca. 5 mm long, navicular but ecarinate, broadly rounded, entire or erose. Lateral sepals free, very inequilateral, oblong-elliptic to spathulate, ca. 5–5.5 mm long, acute or obtuse, dark and thin, the narrow, darker keel serrulate-ciliolate above middle, the apex often exserted. Petal blades elliptic, 5 mm long, yellow, the apex broadly acute,

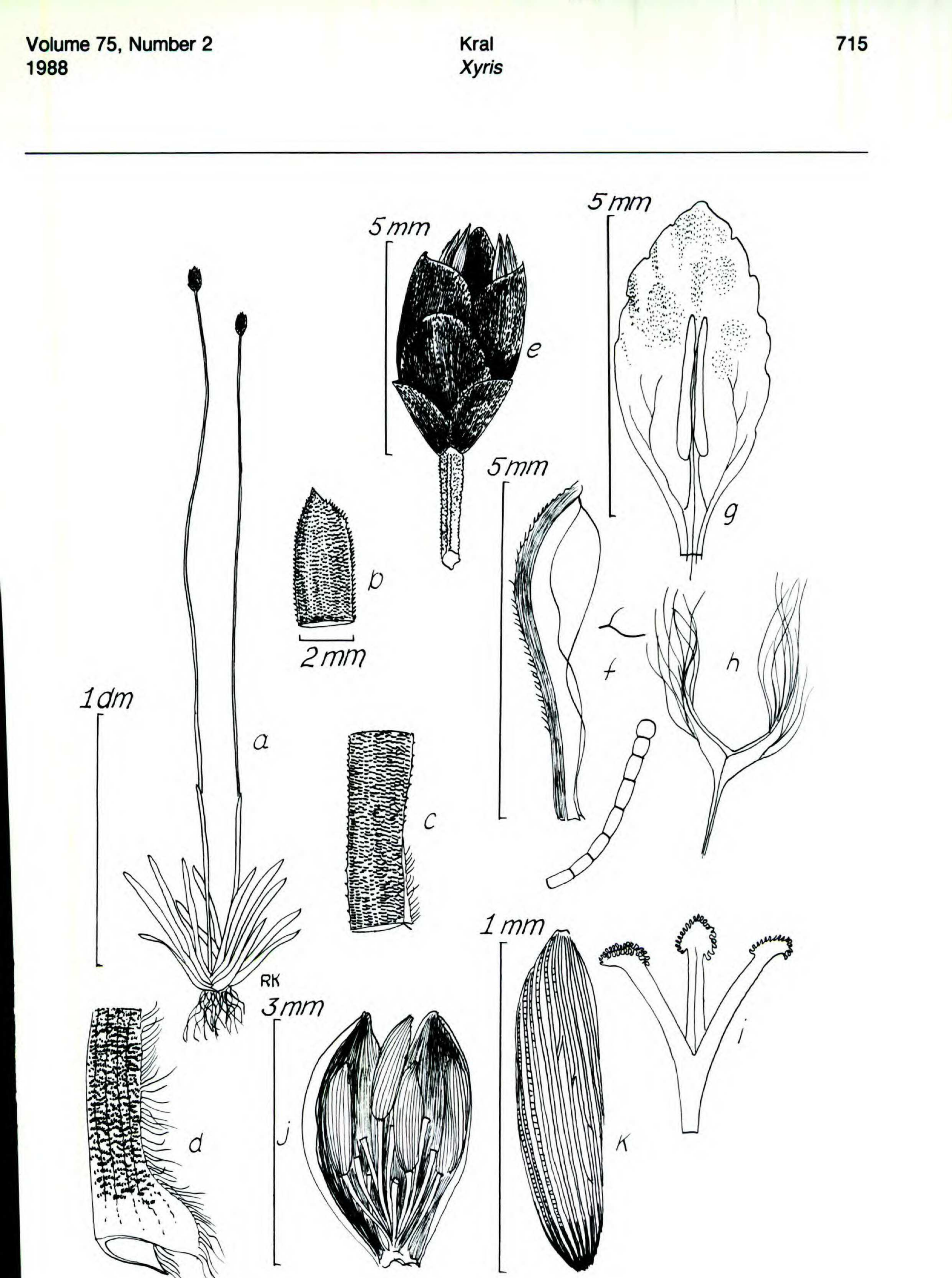


FIGURE 84. Xyris schneeana (Steyermark et al. 128918).—*a. Habit sketch.—b. Leaf apex.—c. Leaf at blade–sheath junction.—d. Leaf base.—e. Spike.—f. Lateral sepal.—g. Petal blade, stamen.—h. Staminode.—i. Stylar apex.—j. Capsule, dehiscing, showing two valves, placentation.—k. Seed.*

the margin sinuate. Staminodia bibrachiate, the branches long-penicillate. Anthers lance-oblong, ca. 1.7–2 mm long, deeply bifid and sagittate, on filaments 0.8–0.9 mm long. Capsule broadly ellipsoid or nearly obovoid, ca. 3 mm long, placentation basal-central. Seeds narrowly ellipsoid or cylindric, ca. 1 mm long, amber, longitudinally finely but distinctly multiribbed.

Distribution. High, sandy, rocky savanna-plain, Chimantá Massif and related tepuis, Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: altiplanicie meridional Acapá-tepui, ubicada en el sector SW del Macizo, 2,200 m, 31 Jan.–Feb. 1984, *Huber & Dezzeo 8636* (NY); cumbre Aprada-tepui, sector sur, ca. 30 km al E de Urimán, ca. 2,500 m, 30 June 1984, *Huber 9580* (MYF, VDB); NW part of summit of Abacapa-tepui, 2,125–2,300 m, 13 Apr. 1953, *Steyermark 74920* (F, NY); sector centro-noreste del Chimantá-tepui, cabeceras orientales del Caño Chimantá, 2,000 m, 26–29 Jan. 1983, *Steyermark et al. 128162* (VDB, VEN); Apacara-tepui, sector Norte del Macizo, 2,200 m, *Steyermark et al. 128372* (VDB, VEN); sección oriental del Chimantá-tepui, cabeceras del afluente derecho superior del Río Tirica (Caño del "Grillo"), 2,450 m, *Steyermark et al. 128918* (VDB, VEN).

The stubby, low habit of the leaves, dull green and papillose-rugulose foliage, small and dark-bracted spikes, and strongly septate capsule valves combine to distinguish this high-tepui endemic.

85. Xyris consolida Kral & Lyman B. Smith, Phytologia 53(6): 434–435, figs. 3, 4. 1983. TYPE: Venezuela. Bolívar: Uaipan-tepui, the summit of west Peak, 1,980 m, small, wet grassy swamp on sandstone, 4 Mar. 1967, *G. Agostini & T. Koyama 7462* (holotype, VEN; isotypes, NY, US). Figure 85A, B.

Plants perennial, solitary or in small tufts; leaf and scape surfaces scabrid; habit lax; roots slender; stems contracted. Leaves all basal, ensiform-linear, 1.5–2 dm long, longer than scape sheaths, spreading flabellately; blades flat, strongly compressed, 3–5 mm wide, olivaceous, multinerved longitudinally, transversely rugose; apices abruptly narrowed, incurved-acute at tip, slightly thickened; margins slightly thickened, minutely tuberculate-ciliate to strigo-ciliate or entire; sheaths gradually narrowed from base to apex, carinate, the carinae ciliate with spreading to retrorse hairs, the sides transversely rugulose, dull olive, multinerved longitudinally, lustrous at base, deeply red-brown, the edges narrow, pale, hirsute-ciliate with sordid trichomes. Scape sheaths twisted, carinate, prominently multicostate with carinae and submarginal costae strongly tuberculate and ciliate, the sheath apex with a short, erect, flat blade. Scapes linear, twisted, 4–6 dm high, subterete or slightly compressed, 1–1.5 mm thick, olive, multicostate, with costae scabrous. Spikes ovoid to broadly obovoid or subglobose, 8–10 mm long, 6–7 mm wide, several-flowered, the bracts loosely spirally imbricate, ecarinate, convex-backed, the margins narrowly scarious; sterile bracts several, gradually passing larger into the fertile bracts, 3.5–4.5 mm long, broadly obovate to obovate, rounded, the margins narrowly scarious; fertile bracts broadly obovate, ca. 5 mm long, rounded-convex; dorsal area absent. Lateral sepals ca. ⅓ connate, inequilateral, ca. 5.5 mm long, the lobes oblong, broadly acute or obtuse; keel wide, thin, entire from base to middle, ciliolate-lacerate from middle to apex. Petal blades obovate, 4–4.5 mm long, yellow, the narrowed apex erose. Staminodia bibrachiate, the branches apically long-penicillate. Ripe capsule ellipsoid, 3.5 mm long, the valves without septa, the placentation basal-central. Seeds oblong-ellipsoid, ca. 1 mm long, amber, strongly multiribbed longitudinally.

Distribution. Known only from the type collection (Uaipan-tepui) and from Ptari-tepui, in Estado Bolívar, Venezuela.

Additional specimens examined. VENEZUELA. BOLÍVAR: Ptari-tepui, cumbre; al norte de la Misión de Santa Teresita de Kavanayen, 2,360–2,420 m, 23 Feb. 1978, *Steyermark et al. 115729* (F, MO, US, VEN).

The scabrous foliage, small, dark-bracted spikes, and connate lateral sepals distinguish this rather low plant. At the beginning of the study it was thought that the two collections represented tepui-summit endemics; a closer

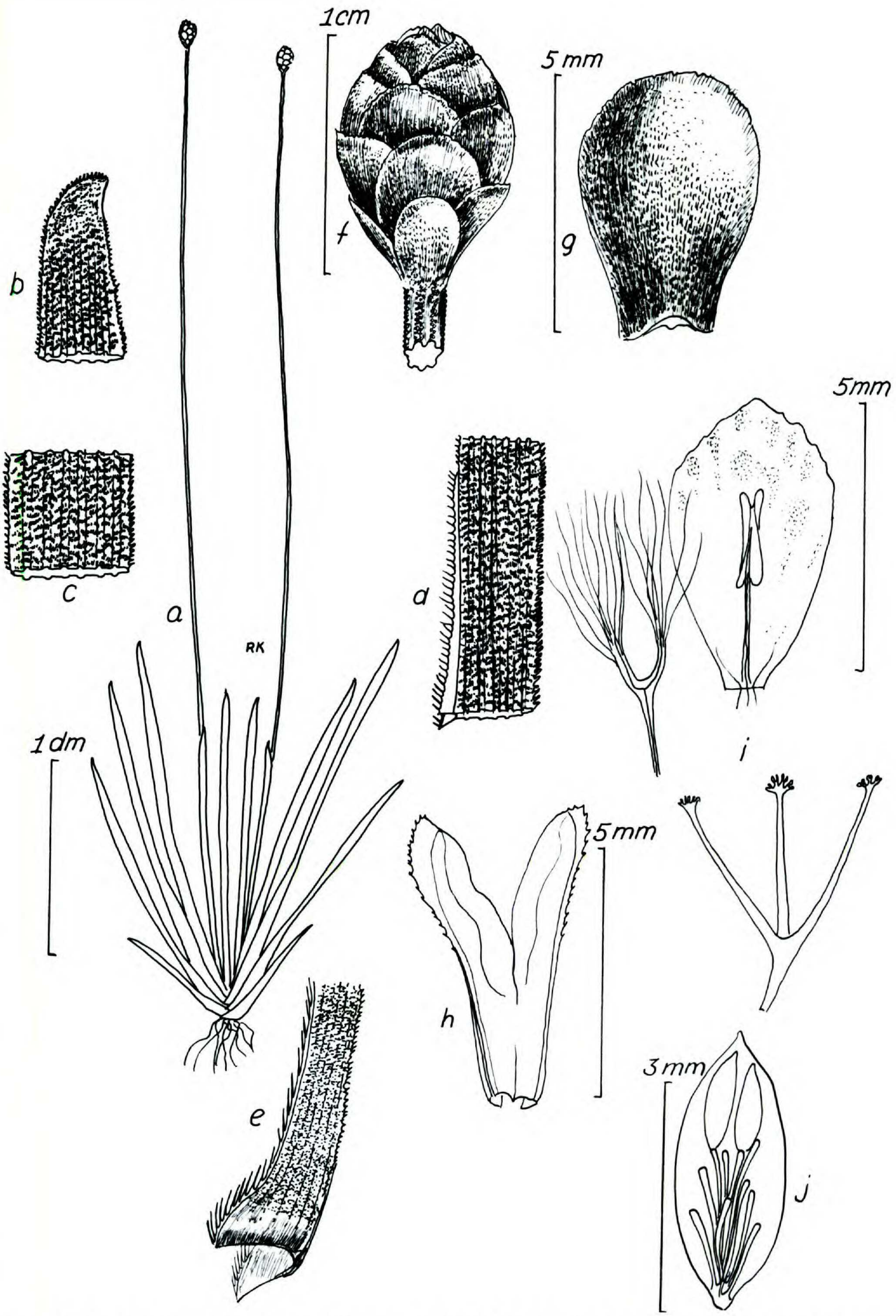


FIGURE 85A. Xyris consolida *(from the type)*.—*a. Habit sketch.*—*b. Leaf apex.*—*c. Sector of midblade.*—*d. Leaf sheath–blade junction.*—*e. Leaf base.*—*f. Spike.*—*g. Fertile bract.*—*h. Lateral sepals.*—*i. Petal, stamen, staminode, stylar apex.*—*j. Median longisection of fruit.*

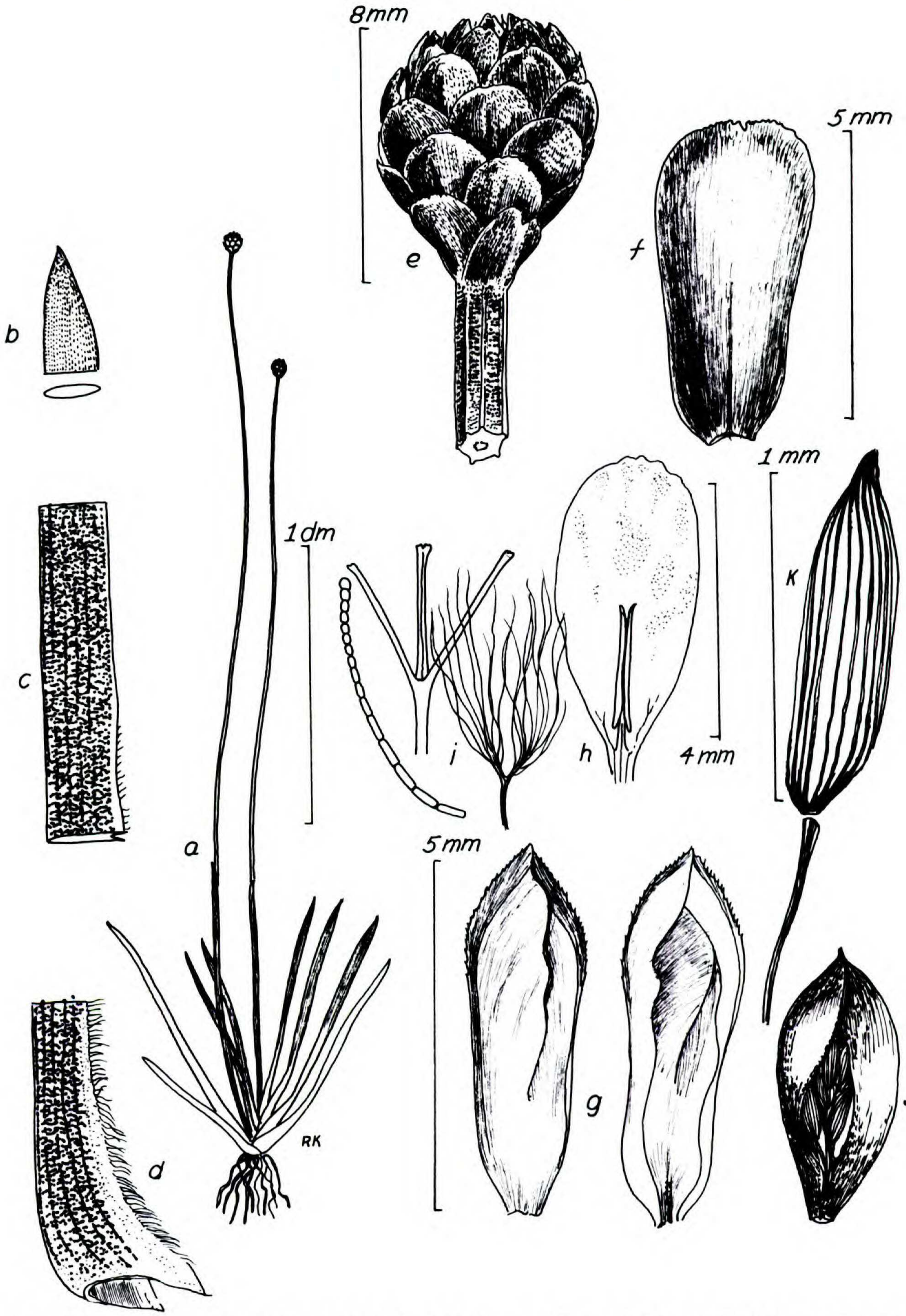


FIGURE 85B. Xyris consolida *(*Steyermark et al. 115729*)*.—*a. Habit sketch.—b. Leaf tip.—c. Leaf sheath–blade junction.—d. Leaf base.—e. Spike and upper scape.—f. Fertile bract.—g. Two views of lateral sepals.—h. Petal blade, stamen.—i. Staminode, stylar apex.—j. External view of dehiscing capsule.—k. Seed.*

examination revealed that, other than the smooth-margined leaves of the Ptari-tepui material, there are no other significant differences between them.

86. Xyris kukenaniana Kral, sp. nov. TYPE: Venezuela. Bolívar: Dist. Roscio Kukenán-tepui, cumbre del sector más septentrional algo separado del macizo principal. Vegetación herbáceo-arbustiva sobre rocas de arenisca y alrededor de lagunas, 5°16′N, 60°48′W, 2,500 m, 28 Apr. 1984, *O. Huber 9460* (holotype, VEN; isotypes, MYF, NY, VDB). Figure 86.

Planta perennis, caespitosa, humilis. Folia linearia, solum basalia, 6–10 cm longa, erecta vel leviter expansa, vaginis scaporum longiora. Laminae folia principalia vaginis 3–5-plo longiores, planae, leviter compressae, 1–1.5 mm latae, pallidae virides, ad apicem abrupte incurvato-acutae, aliquantum incrassatae, a basin gradatim contractae; margines prominente albociliati aut scabrociliati; paginae longitudine grosse nervatae, glabrae vel papillosae; vaginae ciliato-carinatae, pluricostatae, rugulosae, pallide ferrugineae, marginibus a basin ad apicem longiciliatis, in laminas gradatim convergentibus aut ad apicem curtam pilosam ligulam fascientibus. Vaginae scaporum prominente ciliato-carinatae, grosse nervatae, laminis similis laminis foliorum sed brevibus. Scapi recti vel leviter tortae, 1–2 dm longi, distaliter in sectio transversali elliptici, ca. 1 mm lati, anguste ancipiti, 2–3(–4) costati, costis dense pallide scabrociliatis. Spicae ovoideae, atro-ferrugineae vel fuliginosae, 7–8 mm longae, plurifiorae, obtusae, bracteis subdecussatis, laxe imbricatis, sine area dorsali, minute papillosis; bracteae steriles plures, triangulatae vel oblongae, 2–3.5 mm longae, ad apicem albociliatae, obtusae, fertilibus breviores et in eas gradatim transientes; bracteae fertiles late obovatae, ca. 5 mm longae, vadose convexae, ecarinatae, apice rotundatae, integrae tum laceratae. Sepala lateralia libera, leviter curvata, subaequilatera, late lanceolata, 4.5–5 mm longa, acuta; ala carinali angusta, parce longiciliata. Laminae petalorum late obovatae, ca. 4 mm longae, luteolae, ad apicem erosae. Antherae oblongae, 1.5 mm longae, profunde bifidae et sagittatae; filamenta ca. 1 mm longa. Staminodia bibrachiata, dense longipenicillatis. Capsula immatura septa efferentes. Semina non visa.

The plant perennial, cespitose, low. Leaves linear, strictly basal, 6–10 cm long, erect to slightly spreading, longer than the scape sheaths. Blades of principal leaves 3–5 times longer than the sheaths, plane, slightly compressed, 1–1.5 mm wide, pale green, at apex abruptly incurved-acute, somewhat thickened, gradually narrowed toward base; margins prominently white ciliate or scabro-ciliate; surfaces coarsely nerved longitudinally, smooth or papillose; sheaths ciliate-carinate, several-ribbed, rugulose, pale red-brown, the margins long-ciliate from base to tip, gradually narrowing into the blades or producing a short, pilose ligule at apex. Scape sheaths prominently ciliate-carinate, coarsely nerved, with blades similar to leaf blades but shorter. Scapes straight or slightly twisted, 1–2 dm long, distally elliptic in cross section, ca. 1 mm wide, narrowly ancipital, 2–3(–4) costate, the costae densely pale scabrociliate. Spikes ovoid, dark red-brown or sooty brown, 7–8 mm long, several-flowered, obtuse, the bracts subdecussate, loosely imbricate, without dorsal area, minutely papillose; sterile bracts several, triangular to oblong, 2–3.5 mm long, white ciliate at apex, obtuse, smaller than the fertile bracts and grading into them; fertile bracts broadly obovate, ca. 5 mm long, shallowly convex, ecarinate, rounded apically, entire, aging lacerate. Lateral sepals free, slightly curvate, subequilateral, broadly lanceolate, 4.5–5 mm long, acute; carinal keel narrow, sparsely long-ciliate. Petal blades broadly obovate, ca. 4 mm long, yellow, erose at apex. Anthers oblong, 1.5 mm long, deeply bifid and sagittate; filaments ca. 1 mm long. Staminodia bibrachiate, densely long-penicillate. Immature capsule producing septa. Seeds not seen.

Distribution. Known only from the type locality.

Superficially *Xyris kukenaniana* resembles *X. setigera* in general spike bract character and color, and in the coarsely ciliate leaf blades, but the former lacks the excentrically spinulose leaf blade apex of *X. setigera*, and its scapes are definitely sharp-edged and ciliate, very unlike the lustrous and ecostate scapes of *X. setigera*.

87. Xyris delicatula Maguire & Lyman B. Smith, Mem. New York Bot. Gard. 10: 23, fig. 7A–F. 1963. TYPE: Venezuela. T. F. Amazonas: frequent in wet hummocks, Camp Savanna, Campo Grande, 1,500 m, Cerro Sipapo (Pa-

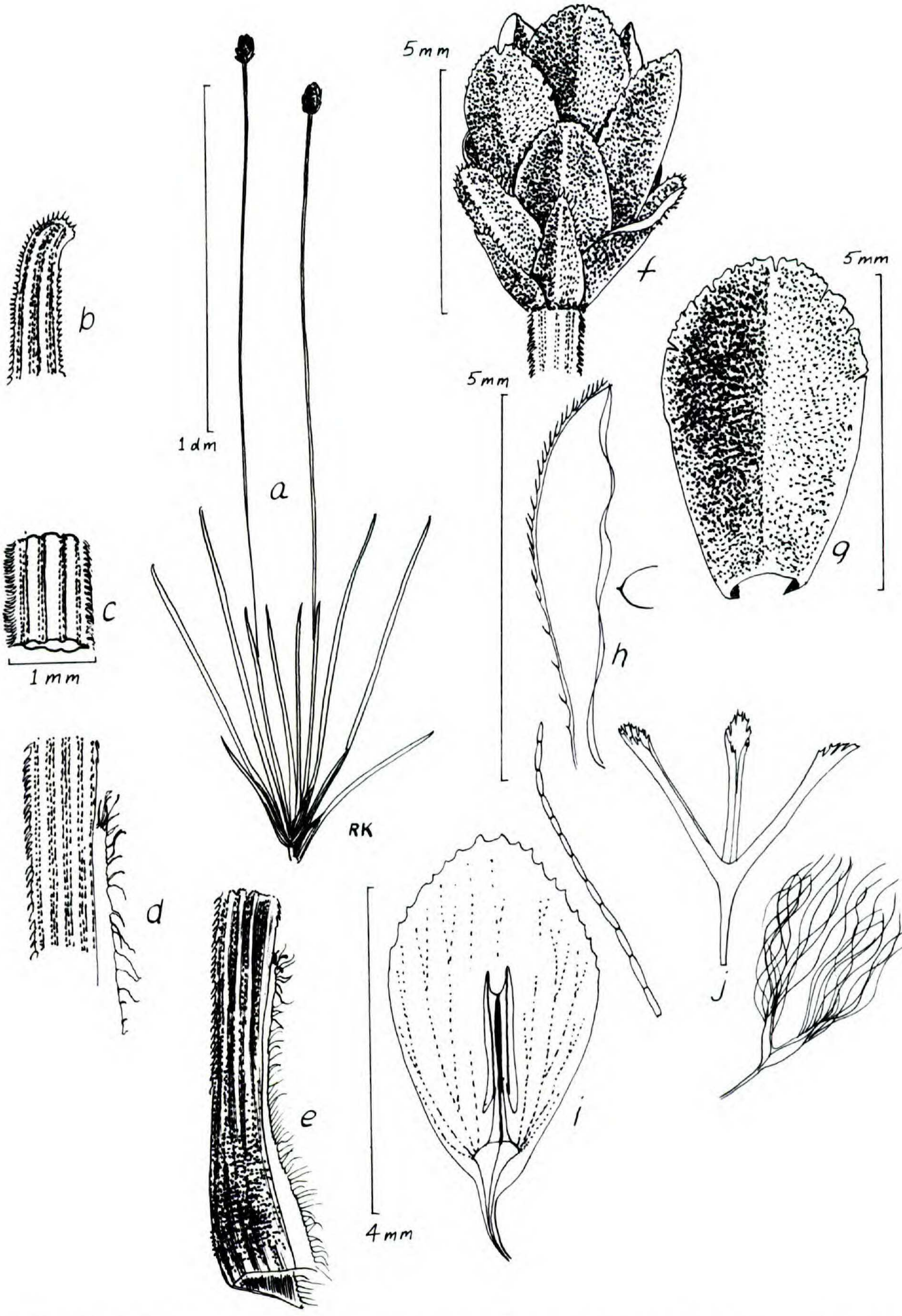


FIGURE 86. Xyris kukenaniana (O. Huber 9460).—*a. Habit sketch.—b. Leaf tip.—c. Sector of leaf at midblade.—d. Leaf blade–sheath junction.—e. Leaf base.—f. Spike.—g. Fertile bract.—h. Lateral sepal.—i. Petal blade, stamen.—j. Stylar apex, staminode, staminodial beard hair, enlarged.*

raque), 10 Dec. 1948, *B. Maguire & L. Politi 27580*. Figure 87.

Slender, densely cespitose perennial 3–5 dm high, the stems contracted. Leaves erect or ascending, 1.5–3 dm long; sheaths less than ½ length of blade, long-ciliate, slightly dilated at very base, ecarinate, pale brown, papillate-rugulose, gradually narrowing, carinate, roseate, at apex producing a narrow

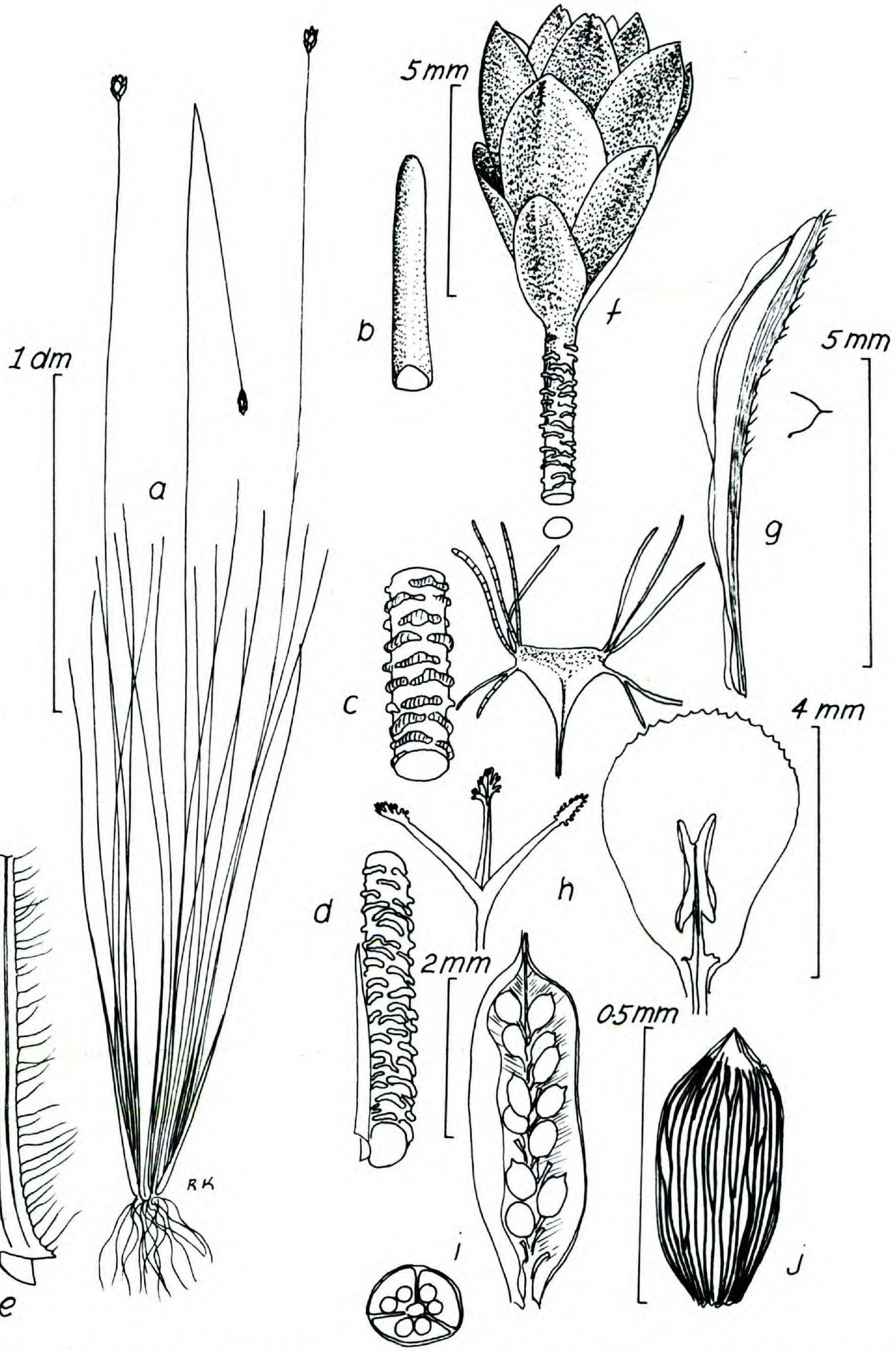


FIGURE 87. Xyris delicatula *(from the type)*.—*a. Habit sketch.—b. Leaf tip.—c. Sector of leaf, midblade.—d. Leaf sheath–blade junction.—e. Leaf base.—f. Spike.—g. Lateral sepal.—h. Stylar apex, petal and stamen, staminode.—i. Capsule, one valve removed.—j. Seed.*

narrowly acute or blunt, scarious, erect ligule to 2 mm long; blades filiform, mostly terete, sometimes slightly flattened, ca. 0.5 mm wide, tapering to a bluntly short-conic, smooth tip above middle, otherwise completely rugose or verrucose, the nerves not evident. Scape sheaths shorter than leaves, strongly rugose, ecarinate, with a very short, blunt cusp above. Scapes straight to flexuous, twisted, distally terete, ca. 0.4–0.5 mm thick, papillose-rugulose. Spikes ellipsoid, drying obovoid, ca. 7–8 mm long, of several firm, erect but loosely spirally imbricate, brown bracts lacking distinct dorsal areas and grading from the smaller, narrowly ovate, slightly carinate sterile bracts to the slightly larger, oblong to narrowly obovate fertile ones, these ca. 6.5–7 mm long, narrowly rounded or broadly acute at apex and with very short apical carinae, the backs convex-rounded, papillate. Lateral sepals free, subequilateral, linear-oblanceolate, ca. 5.5 mm long, acute, erect or excurved, the dark firm keel lacerociliate from middle to apex. Petal blades broadly obovate, ca. 4 mm long, yellow, the broadly rounded apex irregularly denticulate. Anthers oblong, ca. 1.5 mm long, deeply bifid, sagittate, on filaments 0.5 mm long. Staminodes somewhat reduced, broadly bibrachiate, the branches apically sparsely penicillate. Capsule cylindric, ca. 4 mm long, trilocular, the deep septa pulling away from the axis at maturity, thus placentation appearing free-central but really axile. Seeds broadly ellipsoid or ovoid, ca. 0.5 mm long, apiculate, amber, longitudinally finely but distinctly ribbed, some ribs anastomosing.

Distribution. High-elevation tepuis, Territorio Federal Amazonas and Estado Bolívar, southern Venezuela, infrequent.

Additional specimens examined. VENEZUELA. BOLÍVAR: Auyan-tepui, sect. SSE, ca. 12 km al SE del Churun-meru (Salto Churun) 5°47′N, 62°28′W, 2,250 m, *Huber & Medina 8521* (MYF, VEN); Serranía Guanay, sector nororiental, cabeceras mas orientales del Río Paraguaza, 5°55′N, 66°23′W, ca. 1,700 m, 20–28 Oct. 1985, *Huber 11055* (MYF, VDB); altiplanicie del Auyan-tepui, sector centro-oeste del Brazo Occidental ca. 15 km al WSW Salto Angel, 1,860 m, 19 Jan. 1986, *Huber 11248* (MYF, NY, VDB); Auyan-tepui, sector suroriental, 2,140 m, 26 Feb. 1978, *Steyermark et al. 116055* (a mix with *X. setigera*—US).

This species is peripheral to *X. setigera* and, along with *X. carinata* and *X. byssacea*, develops populations at high elevations that are homogeneous but at the same time distinctive on the basis of fine characters. *Xyris delicatula* is indeed close to *X. setigera* but, while its leaves are harsh as in that species, their tips lack the setiform apex so common in the latter, and its scapes are rugose rather than smooth. Interestingly, this is another taxon in which placentation is evidently axile.